2016 Comprehensive Conservation and Management Plan

DRAFT

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I. INTRODUCTION/BACKGROUND

In 1992 when the San Francisco Estuary Partnership produced its first Comprehensive Conservation and Management Plan (CCMP), the community of participants was looking largely *backward* in time, to the 19th century before massive population growth and ensuing development occurred around the San Francisco Estuary region. Goals and actions were crafted with an eye toward restoring landscapes and waterways of a less disturbed era and we cast our restoration objectives with the intent to bring our estuary back to the health and vitality of an earlier time. Twenty-five years later we know that we can never recover that estuary, because in fact, that landscape is no longer possible to recreate.

So what is to be the future of the Bay-Delta Estuary that sits at the heart of our region and serves all of California as the hub of our critical water supply? How can the people and communities that surround the Estuary best protect this economic engine while restoring the values of this greatly stressed union of water, marshes, and mudflats? With the expected impacts of climate change and continued population growth, what will the Estuary look like in 50 years? What do we need to plan for now-- and what actions can we take in the near-term to help ensure a thriving Estuary 35 years from now, despite the changes we can expect, and those which we cannot yet foresee.

These are the pressing questions that the San Francisco Estuary Partnership, working with hundreds of partners over the last 20 years has sought to answer. And it is these questions that shape the core of our new CCMP, the purpose of which is to create a working blueprint that leads to cleaner waters, enhanced habitats, heathier fish and wildlife for the San Francisco Estuary and for the people who call this place home.

About the Partnership

The National Estuary Program (NEP) was established under Section 320 of the 1987 Clean Water Act (CWA) Amendments as a U.S. Environmental Protection Agency (EPA) place-based program to protect and restore the water quality and ecological integrity of estuaries of national significance. The San Francisco Estuary Partnership , one of 28 NEPs, is a collaboration among federal-state-local agencies and NGO's working to protect and restore water quality and the natural resources of the San Francisco Bay-Delta Estuary. Section 320 of the CWA calls for each NEP to develop and implement a Comprehensive Conservation and Management Plan (CCMP).Using the CCMP as a guiding document, Partnership staff act as both implementers (taking action using grant funds and Partnership dollars) and as facilitators of projects (obtaining and passing along grants and contract dollars to other organizations, and administering funds). We directly manage dozens of important projects, including regional green infrastructure planning efforts, aquatic invasive species abatement efforts, urban pesticides and mercury pollution reduction, and estuary-wide boater education work aimed at reducing direct discharges of sewage into the bay. In addition we manage $100 million for our partners in regional restoration, water quality and resiliency projects. Our education efforts include social media outreach, publication of the award-winning *ESTUARY* news magazine, production of State of the Estuary reports and the biennial State of the Estuary conferences, periodic symposiums on timely issues, and publication of numerous fact sheets, booklets, videos, brochures, and other materials that educate the public and decision-makers about the Estuary.

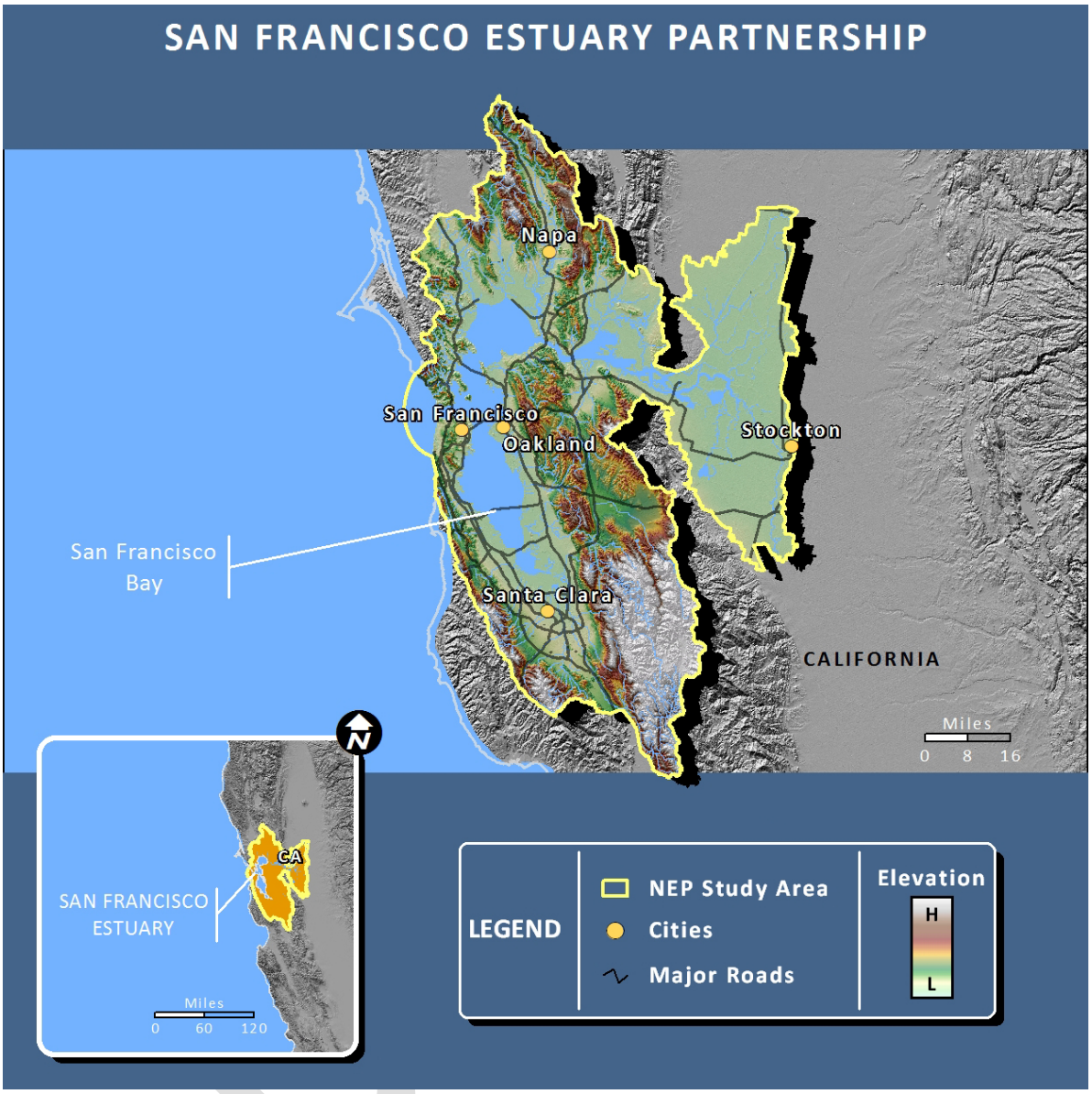

Figure 1. SFEP Planning Area

About the San Francisco Estuary

Our Estuary, the largest in western North America, extends from the mouth of San Francisco Bay to the upstream portion of the San Joaquin-Sacramento River Delta southwest of the city of Sacramento. The Estuary's watershed extends to the ridgeline of the Sierra Nevada, including almost 60,000 square miles and nearly 40 percent of California. The Estuary's waters are a biological resource of tremendous importance—providing critical winter feeding habitat for over a million migratory birds, a productive nursery for many species of juvenile fish and shellfish, and a year-round home for a vast diversity of plants and animals. Half of California's surface water supply falls as rain or snow within this region.

San Francisco Bay includes four smaller bays. Suisun Bay and the diked wetlands of Suisun Marsh are the least salty of these, just downstream of the Delta. Saltier San Pablo Bay is west of Carquinez Strait. The saltiest basins are the Central Bay, which connects with the ocean through the Golden Gate, and the South Bay, a large, shallow lobe extending off the Central Bay, south of the Dumbarton Narrows.

Upstream from the Bay, the San Joaquin-Sacramento River Delta is a thousand-square-mile triangle of diked and drained wetlands. Only small remnants of once-extensive tule marshes still fringe the sloughs and channels that wind between flat, levee-rimmed farmlands on the Delta islands. Before it was diked and drained, the Delta gathered in the fresh waters of the Sacramento, San Joaquin, Mokelumne, and Cosumnes rivers, and moved them all downstream, through a complex array of tidally influenced channels, into salty San Francisco Bay. Today, the Delta and its rich farmland is the engineered junction of one of the world's largest plumbing systems, where much of the system's fresh water is diverted to supply California's population centers and Central Valley agriculture.

CCMP History

The San Francisco Estuary Project's CCMP is a collaborative agreement about what should be done to protect and restore the Estuary-- a road map for restoring the Estuary's chemical, physical, and biological health. The first CCMP, required under a reauthorization of the Clean Water Act in 1987, was produced in 1993 after several years of status assessment and policy discussions which included over 100 different stakeholder groups. After 14 years of implementation, the CCMP was updated in 2007 to include new and revised actions while maintaining many actions from the original.

The 2016 CCMP is an entirely new document. While this version incorporates many of the original CCMP goals, a new emphasis on the need to plan and adapt to climate change is a new focus. In addition, the structure of the new CCMP better reflects our 2015 *State of the Estuary* report assessments which look at five attributes of a healthy estuary: water, living resources, habitats, ecological processes and people. This restructure will allow a more direct evaluation of the outcome of our CCMP actions. This CCMP is also more streamlined, with less than 40 priority actions-- highlighting the intent for the CCMP to include 35 year goals while focusing on urgent actions that will be reviewed and updated every five years.

II. FINDINGS

In September of 2015, the State of the Estuary Report was released. The State of the Estuary Report is the most comprehensive health report ever completed for the San Francisco Bay-Delta Estuary. It uses the best available science and most recent data contributed by over 100 scientists to assess the status of various parts of the ecosystem. The purpose is to identify problems with estuarine health, so that conservation and restoration efforts can focus on solutions.

The following findings come from the Executive Summary of the 2015 State of the Estuary Report, and form the basis for the goals, objectives and actions of the 2016 CCMP.

HOW HEALTHY IS THE ESTUARY?

- The Upper Estuary (Suisun Bay and the Delta) is in fair to poor condition and getting worse, while the Lower Estuary (San Francisco Bay) is in better health but jeopardized by climate change
- We have severely altered the physical processes that create and maintain habitats
    - Freshwater inflows and beneficial floods now exert such a small fraction of their former influence that they no longer build and maintain the physical structure of habitats in the Estuary, nor support critical ecological functions.
    - In the Lower Estuary, similar changes to the hydrology of Bay watersheds and the diking of tidal areas have deprived estuarine wetlands of the sediment they need to build up their elevation in relation to sea-level rise
- This impairment of critical physical processes is intertwined with habitat loss, degradation and fragmentation.
- These losses of physical processes and habitats have reverberated through biological systems, contributing to unproductive food webs, small and declining native wildlife populations, and the dominance of invasive species.

CAN WE IMPROVE THE HEALTH OF THE ESTUARY?

- Improvements in the status of several parts of the ecosystem show that we are very successful at restoring ecosystem health when we choose to make that investment
    - Water quality has improved over the last few decades due to better management and regulation, though some legacy contaminants remain a problem
    - Focused collaboration along with significant funding have resulted in large gains in tidal marsh restoration over the last two decades and improvements in marsh-dependent wildlife populations are now detectable
    - Investments in water conservation and recycling in urban areas are reducing demand for potable water, even while our population is increasing
- Despite these gains, impacts from climate change jeopardizes the health of all parts of the Estuary

WHAT WILL IT TAKE TO ACHIEVE A HEALTHY ESTUARY?

- A bolder approach will be needed to recover from past and ongoing impacts
- The Upper Estuary will require significant investment in restoring critical physical processes and habitats, as well as managing nonnative species and preventing new arrivals
- Protecting the Estuary will require greater efficiencies in human use of the system's fresh water, as well as changes in upstream water management
- The Bay's wetlands are at risk unless we take a watershed-based regional approach to managing sediment and fresh water as essential resources, and allow for tidal wetlands to migrate landward
- Wildlife conservation efforts should aim to ensure successful reproduction and habitat connectivity over time as climate change alters landscapes
- Management actions must all occur in the context of change, requiring collaborative planning for rising seas and other climate change impacts.

III. IMPLEMENTATION

Where do we want to be in 2050 and what can we do in the next five years to get started?

The implementation section of the CCMP contains goals, objectives and actions to guide the region towards a healthier Estuary. The **goals** provide the 35-year vision for the Estuary. The **objectives** detail desired outcomes that make progress towards achieving goals, while the **actions** lay out a set of priority tasks to be accomplished over the next 5 years to reach one or more objective (shown in the matrix at the end of this chapter).

GOAL 1: Sustain and Improve Habitats and Living Resources of the Estuary

Objectives:

a. Protect, restore and enhance environmental conditions and processes that support self-sustaining natural communities
b. Eliminate or reduce threats to natural communities
c. Conduct scientific research and monitoring to measure status of natural communities, develop and refine management actions, and track progress towards management targets

GOAL 2: Increase the Resiliency of the Estuary to Sustain Functions in the Face of Changing Climate Conditions

Objectives:

d. Increase resilience of tidal habitats and tributaries to climate change
e. Increase resilience of communities at risk from climate change impacts while promoting and protecting natural resources
f. Promote integrated, coordinated, multi-benefit approaches to increasing resiliency

GOAL 3: Improve Water Quality and Increase Water Quantity to the Estuary

Objectives:

g. Increase drought-resistance and water efficiency and reduce demand on imported water
h. Improve freshwater flow patterns, quantity, and timing to better support natural resources
i. Reduce contaminants entering the system and improve water quality

GOAL 4: Champion the Estuary

Objectives:

j. Build public support for the value of natural resources and the need to protect, restore, and maintain a healthy Estuary
k. Build on regional leadership and support to protect, restore and maintain a healthy Estuary
l. Promote efficient and coordinated regional governance

ACTION 1 **Develop and implement watershed approaches to comprehensive aquatic resource protection**	ACTION DESCRIPTION: Develop and implement a regional approach to watershed-based environmental protection that coordinates planning, permitting, operations, monitoring, and public reporting for water quality control, flood risk management, water supply management, natural resource extraction, and habitat conservation to protect the lands and waters of the region and the life they should support. Task 1: Develop a White Paper identifying current regional watershed efforts that best model this action; evaluate a set of watersheds that could be used as pilots for this action and based on this review, select 1-3 pilot watersheds. Milestone: Report completed by September 2016 Task 2: Conduct a pilot project in one to three watersheds through a forum of federal, state, regional, and local public agencies most responsible for environmental health to: develop and publish historical (pre-settlement) and present-day profiles to define the current abundance, diversity, and condition of land and water habitats; develop and map alternative future profiles that meet environmental management mandates and regulatory requirements; identify best available regulatory mechanisms that encourage and allow coordinated environmental health improvements (such as cap-and-trade, watershed-based permitting, permit bundling, pollution offset credit trading, alternative compliance, in lieu fees, scaled compliance and effectiveness monitoring, and mitigation banking); and create a mechanism to work more closely on achieving the preferred alternative future watershed profile to recommend ways to apply lessons learned from the pilot throughout the region. Milestone: 1-3 pilots completed by 2021 Task 3: Develop a Northeast Delta Landscape Framework to generate a vision for integrated flood protection, restoration and water recharge, and inform the design of habitat restoration projects. Milestone: Completion of Landscape Framework by 2021
BACKGROUND	Public agencies that administer federal or state laws governing the relationship between people and the environment face two severe threats. Threat one is that the rate at which future climate change and human population growth will alter large-scale environmental processes and baseline levels for ecosystem services will exceed the rate at which environmental regulatory and management agencies can effectively respond through conventional, localized, uncoordinated, individual actions. Threat two is that these agencies are prevented from effectively addressing climate change and population growth by the lack of consistency and coordination among their policies and programs. An important aspect of these threats is that they vary among the watersheds, which also vary in their resiliency to the threats. This will inevitably lead to tradeoffs in ecosystem services between watersheds, which cannot be made except in a regional context. Responsible agencies at all levels of government need to collaboratively implement a regional approach to watershed-based planning and management to develop complimentary local numerical objectives for water supplies, water quality, flood control, natural resource extraction, and habitat conservation in the context of climate change and human population growth. In aggregate, these objectives, plus coordinated plans to achieve the objectives, plus a system to track implementation efforts, plus the assessment and reporting of progress, plus adaptive adjustments in the objectives to reflect new understanding and changing conditions comprise a science-based, democratized health care system for our watersheds.

ACTION 2 **Protect, restore and enhance tidal marsh and tidal flat habitat**	ACTION DESCRIPTION: Restore tidal marsh and tidal flat habitats within the Estuary for multiple ecosystem benefits including recovery of threatened and endangered species. Consider connections between habitats and strive to protect and restore complete tidal wetland systems. Task 1: Restore tidal habitat in the Estuary. Restoration projects in the Bay include those identified in the 2013 *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* maps as "near-term tidal restoration." Milestones: Restore 15,000 acres of tidal habitat in the Bay by 2021; Restore 8,000 acres of tidal habitat in the Delta by 2021 Task 2: Protect land to support preservation and enhancement of tidal habitats. Protected land may include acquiring additional land within the approved acquisition boundary of the San Francisco Bay National Wildlife Refuge Complex as well as other key parcels in the Estuary. Milestone: 500 acres acquired or protected through various mechanisms including transfer of fee title, donation, or easement by 2021.
BACKGROUND	Tidal marshes provide a wide array of ecosystem services. They provide habitat and support food webs for wildlife, stabilize shorelines and protect them from storm damage, store floodwaters and maintain water quality, preserve biodiversity, store carbon, and offer opportunity for scientific study, education, recreation, and aesthetic appreciation. For the Bay, the 1999 *Baylands Ecosystem Habitat Goals Report* set a goal for long term tidal marsh of 100,000 acres, approximately half of the tidal marsh area that existed in the Bay at the beginning of the 19th century. The 2015 *State of the Estuary Report* calculates there is currently approximately 51,300 acres of tidal marsh in the Bay. The milestone of 15,000 acres in the task was derived from the list of active projects in the San Francisco Bay Joint Venture's Project Tracker and represents an ambitious, but achievable outcome based on project status. No similar quantitative long term restoration goal exists for the Delta as does for the Bay from the Baylands Goals Report. Historically, there were approximately 360,000 acres of tidal marsh that existed in the Delta. The 2015 *State of the Estuary Report* calculates there are currently approximately 8,000 acres of tidal marsh in the Delta. Through the California Natural Resources Agency, California EcoRestore is an initiative to help coordinate and advance critical habitat restoration in the Sacramento-San Joaquin Delta over the next four years. California EcoRestore's initial goal includes restoration of 9,000 acres of tidal and subtidal habitat. The action, however, references the 8,000 acres of tidal restoration in the Delta that is required within the U.S. Fish and Wildlife Service Delta Smelt Biological Opinion and referenced in the National Marine Fisheries Service Salmonid Biological Opinion, for coordination of the State Water Project and the federal Central Valley Project. Tidal wetlands are a dynamic continuum of habitats connected by physical and biological processes; they extend from the open waters of the bay through intertidal mudflats, tidal marshes, and adjacent terrestrial areas. Although Actions #2-4 include specific milestones for individual habitat types and it is critical to be able to track those milestones, it is also important to consider the connections between habitats and the full gradient of ecological functions and ecosystem services and protect and restore "complete tidal wetland systems" where possible.

ACTION 3 **Identify, protect, and create transition zones**	ACTION DESCRIPTION: Identify, inventory and protect existing and projected transition zones to accommodate upslope wetland migration and sustain tidal marshes under multiple sea level rise scenarios. Where feasible, integrate transition zone creation into new restoration and enhancement projects. Consider connections between habitats and strive to protect and restore complete tidal wetland systems. Task 1: Secure funding and identify and inventory existing and projected transition zones based on existing and planned tidal marsh habitat, land use and ownership, elevation, and other criteria Milestone: Inventory completed by 2016 Task 2: Protect identified transition zones through acquisition of fee title or partnerships to develop conservation easements or other management agreements Milestone: 10 of identified sites protected or planned for protection by 2021 Task 3: Include creation of transition zones in tidal restoration projects where feasible Milestone: Inclusion of transition zones in five tidal restoration projects by 2021
BACKGROUND	Efforts to address the ecological and economic threats imposed by sea-level rise and other aspects of climate change have begun to focus on the estuarine–terrestrial transition zone (between tidal wetlands and local watersheds), the "transition zone." With sea level rise, tidal marshes will need to migrate upland. Planning for that migration includes using projections of sea level rise and other changes to identify shifts in habitat location and connectivity over time. The transition zone can provide space for the Estuary to expand without creating unacceptable flood hazards and without losing the ecosystem services provided by tidal wetlands. In addition to providing space for wetlands to migrate, transition zones also provide habitat and foraging areas for native wildlife, refuge from predators and high water, and corridors for wildlife to move along the shore or between the wetlands and watersheds. Existing and projected transition zone lands need to be identified and acquired or protected where feasible. A collaborative transition zone assessment program is recommended in the *Baylands Habitats Goals Science Update* (BEHGU) that would include potential transition zone assessment, project tracking, performance evaluation, applied research, and public reporting. BEHGU recommends developing a map of the full extent of transition zones as defined in the report and standardizing methods to assess existing and restored transition zones. In addition, new restoration and enhancement projects provide opportunities to create transition zones as part of the project. The *Tidal Marsh Recovery Plan* includes an action focused on allowing for landward transgression of high marsh zones by acquiring/protecting adjacent undeveloped lands not yet serving as habitat. In addition, the *Conservation Strategy for Restoration of the Sacramento-San Joaquin Delta* discusses importance of transition zones in the Delta region. Tidal wetlands are a dynamic continuum of habitats connected by physical and biological processes; they extend from the open waters of the bay through intertidal mudflats, tidal marshes, and adjacent terrestrial areas. Although Actions #2-4 include specific milestones for individual habitat types and it is critical to be able to track those milestones, it is also important to consider the connections between habitats and the full gradient of ecological functions and ecosystem services and protect and restore "complete tidal wetland systems" where possible.

ACTION 4 **Protect, restore, and enhance intertidal and subtidal habitats**	ACTION DESCRIPTION: Protect, restore and enhance beneficial intertidal and subtidal habitats in the Estuary. Consider connections between habitats and strive to protect and restore complete tidal wetland systems. Task 1: Increase populations of native eelgrass (*Zostera marina*) by increasing the coverage of existing beds or establishing new beds. Milestone: Increase eelgrass coverage in the Bay by 25 acres by 2021 Task 2: Increase population of native oyster (*Ostrea lurida*) by increasing the coverage of existing beds or establishing new beds. Milestone: Increase native oyster bed coverage in the Bay by 25 acres by 2021 Task 3: Identify appropriate and feasible sites, secure funds, and implement other intertidal/subtidal restoration projects, including rocky intertidal, sand beach, macroalgal bed, and living shorelines and other integrated habitat approaches. Milestone: Implement five projects by 2021 that focus on rocky intertidal, sand beach, macroalgal bed, and/or living shorelines and other integrated habitat approaches in the Bay
BACKGROUND	Intertidal and subtidal habitats are a critical component of the Estuary ecosystem. In addition to tidal wetlands, intertidal habitats can include mudflats, rocky areas, sand beaches, macroalgal beds, oyster and eelgrass beds. Eelgrass performs a wide variety of functions. Eelgrass provides shelter and food for many species of birds both directly and indirectly. Eelgrass is also used as a preferred substrate for spawning by Pacific herring. Eelgrass beds dampen wave energy and slow currents in a manner that results in trapping sediment, reducing turbidity, and protecting shoreline areas from erosion. Shellfish beds also provide several ecosystem functions and support several ecosystem services. The small native Olympia oysters can be considered a "foundation species," altering their environment by increasing bottom roughness, reducing current speeds, and as a result, trapping sediments. Oysters also increase physical heterogeneity, which can increase diversity of other marine invertebrates and also result in higher fish diversity and abundances than in neighboring, less complex habitats. Increased abundance of native oysters can locally increase the number of other benthic invertebrates. The *San Francisco Bay Subtidal Habitat Goals Report* (Subtidal Goals Report) produced in 2010 contains restoration goals for native eelgrass and oysters in San Francisco Bay. The Subtidal Goals report includes the goals of increasing eelgrass and oyster populations in the Bay within 8,000 acres of suitable subtidal/intertidal area over a 50-year time frame using a phased approach under a program of adaptive management. The benchmarks under the phased approach are to increase eelgrass and oyster coverage by 25 acres within 5 years, 100 acres within 10 years, and up to 8,000 acres within 50 years. The Subtidal Goals Report also contains protection and science goals for intertidal/subtidal mudflats, rocky areas, sand beaches, artificial structures, and macroalgal beds. Tidal wetlands are a dynamic continuum of habitats connected by physical and biological processes; they extend from the open waters of the bay through intertidal mudflats, tidal marshes, and adjacent terrestrial areas. Although Actions #2-4 include specific milestones for individual habitat types and it is critical to be able to track those milestones, it is also important to consider the connections between habitats and the full gradient of ecological functions and ecosystem services and protect and restore "complete tidal wetland systems" where possible.

ACTION 5 **Maximize habitat benefits of managed wetlands/ponds**	ACTION DESCRIPTION: Maximize habitat benefits of managed wetlands/ponds for all species. Focus tasks on better understanding bird use of managed ponds as well as the long term efficacy of managed ponds as habitat. Task 1: Manage islands and levees and adjacent water levels in managed wetlands/ponds to provide increased nesting, foraging, roosting, and high tide refuge habitat for birds and analyze response of birds to specific measures with collection and analysis of monthly bird surveys in the Bay. Milestone: Produce a yearly report beginning in 2016 on bird response to specific management measures employed at ponds in the Bay. Task 2: Study the efficacy of managed wetlands/ponds on their ability to sustain waterbird numbers in the Bay by analyzing regional waterbird monitoring data with regard to managed pond use and density over time as compared to other habitats. Milestone: Produce report comparing bird use of various habitat types in the Bay by 2020 Task 3: Develop a methodology for assessing the long term costs and benefits of managed wetlands/ponds including habitat benefits for multiple species and maintenance requirements in response to impacts of climate change such as sea level rise. Milestone: Collaborative development and implementation of methodology by 2020
BACKGROUND	Managed wetlands/ponds are typically shallow open water habitat with managed tidal inputs. Managed wetlands/ponds provide habitat for a variety of wildlife species, including fish, birds and invertebrates. The water depth and salinity in the ponds affect the types of birds, fish and invertebrates that live in the ponds. Managed ponds can provide feeding, roosting (resting) and breeding areas for a variety of waterbird species, and optimizing ponds for specific birds requires continual active management, evaluation and response. Managing large areas for very targeted water depths and salinity is a time and resource intensive effort. The effects of climate change, particularly sea-level rise, challenge the long-term viability of managed ponds. Climate-change-related stressors, such as higher water levels, a greater frequency and intensity of storm events, and regional salinity shifts, may make it difficult or even impossible in the future for managers to maintain target habitat conditions inside the ponds. In addition, key uncertainties remain regarding bird use of managed ponds including the ability of managed ponds to sustain waterbird numbers over time. These uncertainties and ecological and economic trade-offs must be assessed in conjunction with other regional planning efforts such as the *Recovery Plan for Tidal Marsh Ecosystems* and the *Baylands Ecosystem Habitat Goals Update*. As part of the South Bay Salt Ponds Project, monthly bird surveys have been conducted since 2003 to evaluate responses to changes in habitat and a Pond Management Working Group comprised of bird researchers and managers meets regularly to fine tune management responses.

ACTION 6 **Protect, restore, and enhance riparian habitat**	***Action under development – may combine with Action 7*** ACTION DESCRIPTION: Protect, restore and enhance riparian habitat by providing tools to identify and implement riparian restoration projects. This action supports Bay Area watershed management by compiling and mapping information to inform and improve aquatic resource management and regulation across public policies, programs, and projects to protect, restore, and improve habitat conditions, ecosystem functions, and natural stream processes. Task 1: Upload relevant riparian assessment findings, constructed riparian project information, and potential future riparian project information to the SF Bay Joint Venture's Project Tracking Tool linked to EcoAtlas (done by individual project proponents) Milestone: on-going, starting January 2016 Task 2: Establish technical advisory working groups to identify data gaps, provide guidance on assessment and restoration design tools, and compile existing riparian evaluation systems to establish a "Riparian Criteria" tool by which to evaluate proposed projects based on various objectives. Milestones: Riparian Criteria established by September 2017 Task 3: Project proponents and/or project evaluation teams apply the Riparian Criteria Tool to evaluate and prioritize projects, help develop partnerships, and secure funding support to implement riparian restoration projects. Milestone: Restoration of 20,000' of riparian habitat by 2021
BACKGROUND	Riparian areas modulate and filter stormwater delivery to creeks, provide valuable habitat benefits for a wide range of wildlife taxa, and shade waterways, maintaining desirable water temperatures. Many or most mainstem channels and tributary reaches in the region are incised, for a variety of reasons, and the impact on habitat and the ability of eggs and juvenile fish to survive is seriously degraded, both in terms of the suitability of habitat and sufficient summer streamflow. The action supports the inventory of riparian cover in key streams and stream reaches, and identification of restoration priorities, which will guide riparian corridor improvement and expansion actions. The action envisions a tool to facilitate evaluation and prioritization approaches based on specific, local conditions and limitations to improve overall condition. The San Francisco Bay Joint Venture helps partners realize shared habitat goals by connecting them with the funding opportunities, science and resources they need through the Joint Venture's habitat project tracking database. The Joint Venture is currently transitioning the database for management by the San Francisco Estuary Institute and will be merged with project data from other partners into SFEI's EcoAtlas, an online source for information, maps and tools. Part of the expansion of the tracking database will be an increase in information about riparian areas. This action focuses on the need to compile various riparian analysis tools and project criteria into one tool that can be used to evaluate various types of projects.

ACTION 7 **Protect and restore critical coldwater habitats in tributary streams**	***Action under development – may combine with Action 6*** ACTION DESCRIPTION: Identify, assess and map critical coldwater habitats to provide planners with the basis for defining and prioritizing streamflow conservation and enhancement opportunities on high value streams. Protect the sources of flows that maintain dry season aquatic habitats, particularly pool habitats in upstream areas. Task 1: Use available and newly-developed information to assemble a regional GIS database of streams and stream reaches in the Estuary that support salmonid populations and opportunities to protect and increase genetic diversity and resilience (including amphibian and reptile species of concern mapping). The database will also include potential priority protection and restoration areas in both rural and urban watersheds of all sizes. Milestone: Completed GIS database by 2017 Task 2: Using the database, complete an assessment of the relative importance of the stream and creek flows around the region that contribute to, or could contribute to existing or possibly reintroduced steelhead and salmon populations. Milestone: Completed assessment and report by 2018 Task 3: Where critical streamflow information is not available, establish required new gauges and surveys in a select number of important tributaries in the region. Milestone: New gauges and surveys established by January 2018 Task 4: With a Technical Advisory Committee, establish minimum flow recommendations for prioritized streams and stream reaches. Milestone: Set flow standards recommendations by 2019
BACKGROUND	The database will be the basis for decision-making and tracking regarding conservation and enhancement of coldwater resources. The database should be housed at an institution with the skills, support and reputation to establish and maintain the GIS, and to coordinate with various stakeholders to add new layers and produce maps and shape files for their and the public's need. With iconic fish species struggling for survival in the regional watersheds in the Bay region, an effort is needed to locate and map the Bay Area's most important coldwater habitat resources. This work should account for three factors related to protecting and enhancing streamflow in priority aquatic habitats: sources, instream flow need (IFN) and impairment (i.e., direct diversion and groundwater withdrawals that can be associated with changes in streamflow). Each of these factors relies on the existence of streamflow data; therefore this work should also include the costs of purchasing, installing, calibrating, and maintaining new gauges through a coordinated effort aimed at collecting the minimum information required to inform management of critical surface and groundwater resources. Ongoing research by consultants, agencies, academics and non-governmental organizations will be used to refine the identified coldwater habitat resources. For example, data from salmonid outmigrant trapping efforts reveal areas most likely to produce steelhead smolts—and therefore areas having the most desirable aquatic habitat conditions in relation to stated management goals. Once established, the areas should be considered the primary focus of a regional program that protects and restores their ecological function, particularly in relation to streamflow, channel condition and alignment, and riparian corridor health.

ACTION 8 **Establish a regional wetland and stream monitoring and assessment program**	ACTION DESCRIPTION: Plan and implement a Bay-Delta Regional Watershed Monitoring and Assessment Program to provide local, regional, state, and federal agencies with essential data and information needed to assess compliance and effectiveness of policies, programs, and projects intended to sustain a healthy aquatic resources, where the regional watersheds in aggregate include all the shallow subtidal and intertidal areas of the Estuary, and all the lands draining to these areas within the counties of Santa Clara, San Mateo, San Francisco, Marin, Sonoma, Napa, Solano, Yolo, Sacramento, San Joaquin, Contra Costa, and Alameda. Task 1: Establish and Bay-Delta regional steering committee to oversee development of the Regional Watershed Monitoring and Assessment Program. Milestone: Report completed by 2016 Task 2: Identify the highest priority management and regulatory questions and decisions that will drive the monitoring and assessment program. Milestone: Report completed by 2016 Task 3: Develop a business model to fund the minimum program that is needed. Milestone: Business model completed by 2017 Task 4: Initiate immediately needed, doable, and funded management of existing data and collection of new monitoring data Milestone: Collection and management of existing data and collection of high priority additional data initiated by 2018
BACKGROUND	Large amounts of public funds and human resources continue to be invested in the protection, creation, restoration, and enhancement of natural aquatic resources in the region. Regional plans call for hundreds of thousands of acres of tidal marshlands and other kinds of wetland areas, as well as hundreds of miles of restoration of streams and riparian areas, while also calling for adequate flood control, indigenous water supplies, and new development to sustain local economies. These plans are being implemented as on-the-ground projects that alter the distribution, abundance, diversity, and condition of aquatic resources and their human uses. A regional monitoring and assessment program is needed to evaluate the performance of these and other plans based on the performance of their implementation projects. To track the progress of the projects, troubleshoot problems, and to assess the contribution of projects to the health status and trends of our ecosystems, projects need to be compared to each other and over time, relative to ambient or background conditions. These needs cannot be met at this time because projects are monitored in disparate and incomparable ways, plus there is little assurance of data quality, monitoring results are not readily available for analysis, and the ambient condition of most aquatic resources is unknown. While the Bay and Delta Regional Monitoring Programs systematically monitor water quality in the open waters of the Bay and Delta, and while the Surface Water Ambient Monitoring Program provides basic information about the water quality of selected rivers and streams around the Estuary, there is no ambient monitoring of wetlands or riparian areas.

ACTION 9 **Protect, restore and enhance seasonal wetlands**	ACTION DESCRIPTION: Protect and restore seasonal wetlands within the region using conservation easements and related acquisition tools to maintain viable populations of rare plants and animals, sequester greenhouse gases, and to support ranching communities and regional food production through improved rangeland management ('working landscapes'). Task 1: Re-establish the Interagency Vernal Pool Stewardship Initiative among State and federal agencies and through the Initiative build relationships with land trusts and conservancies, landowners, Resource Conservation Districts, and municipalities to coordinate planning efforts. Milestones: Form Vernal Pool Stewardship Initiative by September 2016; Produce report on conservation priorities for vernal pool habitats by 2017 Task 2: Through the Initiative, leverage funding and investments (including loans from the Clean Water State Revolving Fund) to protect targeted vernal pools. Milestones: 25% of the targeted acres in the process of being protected through easements and other agreements by 2018; Protect at least 300 acres of vernal pool landscapes in the San Francisco Bay region and an additional 500 acres in the Delta Region by 2021
BACKGROUND	Seasonal wetlands are wetlands within a matrix of uplands. Seasonal wetlands may be former tidal marshes that have been closed off from tidal action by the construction of dikes and levees. With each year's winter rains, these low-lying areas fill with fresh water, and then slowly dry out after the rainy season ends. Salt grass, bulrush, and cattails near the Bay are species typically found in seasonal wetlands. Other depressions in the upland area where saline soils support marsh species may also be seasonal wetlands. Basins in relatively flat areas or on gently rolling ground are typically wetlands and may be termed vernal pools, seasonal wetlands or marshes, or wet meadows. They typically consist of seeps, wet soils and vernal pools. These habitats may host large numbers of waterfowl and shorebirds during the winter and spring migratory periods, and may support several rare or endangered plants and invertebrates. Vernal pools are seasonal wetlands that occur when landscape depressions in grasslands and oak savannas underlain with impermeable soils fill with rainwater, floodwater, and/or shallow groundwater in the winter and spring, and then dry during the spring and summer. Vernal pools occur upon grasslands (rangelands) and across oak savannas that are at extreme risk of fragmentation and conversion to cultivated agriculture and suburban development. These unique wetlands are an essential part of the Estuary's wetlands portfolio, but conservation work on these wetlands has lagged behind our collective work on other important aquatic habitats (e.g., freshwater marsh, riparian corridors, salt marsh). Vernal pools are protected by State and federal laws, and many of the plants and animals they support are listed under the State and federal Endangered Species Acts (CESA and ESA). Habitat loss and fragmentation is the single largest threat to the survival and recovery of sensitive species as identified in the Vernal Pool Recovery Plan issued by the U.S. Fish and Wildlife Service. The Interagency Vernal Pool Stewardship Initiative was forged in 1996 as a process for multiple agencies to collaborate in the conservation of vernal pools with a comprehensive ecosystem-based approach, while also ensuring economic development proceeded. Resource constraints led to the dissolution of the Initiative. Re-establishing the Initiative will facilitate collaboration with public and private parties to identify, protect, and restore vernal pool landscapes in a manner that promotes sustainable grazing and livestock production.

ACTION 10 **Minimize the impact of invasive species**	ACTION DESCRIPTION: Reduce the impact of invasive species through prevention, early detection, rapid response, eradication, and control. Conduct work with national and regional coordinating bodies and the key agencies implementing specific programs. Task 1: Expand and improve prevention programs for invasive species. This may include developing new policies and programs, and/or conducting more outreach to targeted communities. Key aquatic issues include improving the ballast water management program, improving management of recreational boats moving species overland (via boat trailers), and preventing introduction and spread of fouling species along the coast (via several vectors). Milestone: Develop and refine policies, coordination and streamlined programs throughout the western region, increase outreach, and identify priority activities by 2021 Task 2: Increase early detection, monitoring, and rapid response in the region. Assess and map estuary wide distribution of key invasive species. Improve on the Calflora website and expand it to wetland species and increase citizen reporting of species. Work with professional divers associations and train them to detect new invasive species as they are cleaning boat bottoms. Increase the amount of scientific monitoring to measure the number of new species coming into the region. Milestone: Identify funding sources for early detection, monitoring, and rapid response by 2021 Task 3: Implement eradication and control programs with priority given to species detected early, species that have a chance of being eradicated, and species that have extensive impacts on key habitats. Key invasive species that are currently being addressed include, but are not limited to: invasive *Spartina*, *Lepidium*, water hyacinth, *Egeria*, and *Arundo donax.* Eradication and control programs should be assessed on a regular basis to determine the overall effectiveness of the program and potential impacts to threatened and endangered species. Climate change should also be taken into account developing and implementing eradication and control programs. Milestone: Number of species with populations reduced or eradicated by December 2021; Number of acres of invasive species removed of key species by 2021 Task 4: Increase specificity in permit language requirements for restoration projects with non-native plant monitoring requirements. Confirm that Best Management Practices are shared for species where they exist (ex: Invasive *Spartina* Project Best Management Practices 2010), and that "percent cover" requirements are appropriate to individual species. Milestone: Number of permits with improved non-native plant requirements by 2021
BACKGROUND	Invasive species pose a threat to native species and habitats. Prevention is the best and most cost effective method to reduce the rate of invasion of new species, but management activities need to also include improving early detection programs (which could possibly allow for successful eradication) and to control invasive species that are impacting key habitats. The State Aquatic Invasive Species Management Plan, the State Weed Plan, and the State Strategic Framework for Preventing the Spread of Invasive Species, should be used as guidance documents along with the strategic plan for the Federal Aquatic Nuisance Species Task Force. Agencies should be prepared for rapid response if a species is detected, and determine if eradication and or containment is possible. In the state AIS plan, there is a Rapid Response Plan, but there is limited money for training, and limited money for implementation.

ACTION 11 **Increase the efficacy of predator management**	ACTION DESCRIPTION: Increase the efficacy of predator management to promote healthy populations of wildlife. Task 1: Assess and guide predator management on publicly-owned conservation lands that support threatened and endangered species by undertaking the following: 1) develop protocol and data infrastructure for predator management activities including predator surveys; 2) assess predator management strategies in their ability to impact populations of listed threatened and endangered species (in particular Ridgway's rail, Western snowy plover, and California least terms), including including direct removal of predators as well as landscape alterations to reduce predator populations and access to habitat; 3) develop map of prioritized predator management needs (map will synthesize information regarding observed and predicted species-specific predator abundance and distribution, high tide refugia availability, and observed and predicted T and E species abundance); and 4) land managers implement more effective, targeted predator management strategies with the goal of increasing populations of target species. Milestone: Site-specific and strategy-specific predator management recommendations produced by 2017. The largest public conservation landowner, USFWS, begins implementing recommendations on Don Edwards NWR by 2018. Task 2: Develop a map showing priority areas in the San Francisco Estuary where actions can be taken to reduce feral cat predation on sensitive species, particularly Ridgway's Rail. The cat predator threat assessment and opportunities map will include: 1) locations of known or suspected feral cat colonies and feeding stations; 2) identification of entity(s) maintaining each cat colony (individual, group sanctioned, or city/county authorized activity); 3) jurisdictions of landowners with the authority and willingness to enforce law – map to include all landowners of marshes and adjacent areas; 4) city and county cat-feed station laws: critical Ridgway's Rail populations; and 5) housing and urban development, including landfills/transfer stations. Milestone: Feral cat threat assessment and opportunities map produced by 2017
BACKGROUND	The 2011 *State of the Birds San Francisco Bay* report identifies introduced and increased predators, such as non-native red foxes, Norway rats, and house cats, and native raccoons, corvids, and gulls, as a threat to tidal marsh birds. Introduced and increased predators prey upon birds nesting in marshes surrounding the Bay and predator numbers are usually inflated near urban areas. Feral cat colonies have become established in parks and other wildlife habitat areas often with the help of advocates. Unfortunately, many of these colonies create a source of predation on adjacent wildlife areas destroying vast numbers of birds and other small creatures. The *State of the Birds* report advocates controlling introduced predators (particularly in areas with high concentrations of marsh birds) and removing feral cat feeding stations, as well as educating the public about the impact of cats on bird populations. Through this action, high priority areas for predictor control will be defined and mapped. Conservation organizations will use the threat assessment and opportunities map to collaborate with others to increase the effectiveness of feral cat management and outreach for the purpose of increasing tidal marsh-dependent wildlife populations.

ACTION 12 **Increase carbon sequestration through wetland restoration, creation, and management**	ACTION DESCRIPTION: Increase carbon sequestration through wetland restoration and creation projects. Focus near term tasks on converting subsided agricultural land to managed wetlands to reverse subsidence and to reduce greenhouse gases in the atmosphere by sequestering carbon and advancing scientific understanding of carbon sequestration. Task 1: Work with agencies and willing private landowners to identify appropriate sites, identify funding sources, and plan and implement projects to create managed wetlands on former agricultural lands in the Delta. Milestone: Convert 3,000 acres to wetlands in the Delta by 2017 Task 2*:* Conduct applied research to inform better carbon and greenhouse gas management as part of restoration designs and management approaches. Quantify the greenhouse gas emissions from different types of wetlands and different management regimes. Milestone: 1-3 applied research studies on carbon sequestration and restoration/management approaches completed and published by 2021
BACKGROUND	Carbon sequestration is an important component of wetland restoration and creation in the Estuary. Improving carbon management in wetland restoration and creation projects can prevent further subsidence, increase organic matter accumulation, reduce greenhouse gas emissions, and sequester more carbon. Long-standing farming practices in the Delta expose fragile peat soils to wind, rain and cultivation, emit carbon dioxide (CO2) and cause land subsidence. To capture or contain the carbon, new wetlands can be created on agricultural lands. In doing so, they would begin to rebuild the Delta's unique peat soils, take CO2 out of the atmosphere, and ease pressure on the Delta's aging levees. Carbon-capture farming works as CO2 is taken out of the air by plants such as tules and cattails. As the plants die and decompose, they create new peat soil, building the land surface over time. The USGS and DWR have partnered on a pilot project on approximately 2000 acres that shows that it is highly feasible to use managed wetlands to sequester carbon and reduce subsidence. On deeply subsided Twitchell Island in the western Delta, USGS scientists recorded elevation gains and significant carbon capture has also been monitored. More studies are needed to determine the long term benefits and costs of created wetlands. Through the California Natural Resources Agency, California EcoRestore is an initiative to help coordinate and advance critical habitat restoration in the Sacramento-San Joaquin Delta over the next four years. California EcoRestore's initial goal includes creation of 3,500 acres of managed wetlands, specifically for subsidence reversal and carbon management, on Sherman Island, Twitchell Island and Staten Island. Challenges to that goal include land acquisition and resources for creation and management. The action includes a slightly reduced outcome of 3,000 acres converted over five years, both on public and private lands (based also on goals in the Delta Stewardship Plan). The *Baylands Ecosystem Habitat Goals Update* recognizes the importance of carbon management and includes recommendations for promoting accumulation of carbon in wetlands as well as for applied research that is needed.

ACTION 13 **Restore Estuary-watershed connections for multiple benefits, including flood risk management and habitat**	ACTION DESCRIPTION: Plan and implement multi-objective projects that enhance the array of habitat values, natural processes, and ecosystem services within the Head of Tide zones of tributary watersheds to the Bay and Delta floodplains. Potential benefits of integrated projects may include: tidal, floodplain, riparian, intertidal habitats such as rocky shorelines, subtidal habitats such as eelgrass and oyster beds, and open water habitat creation/restoration for a variety of aquatic and terrestrial species; flood management; water quality improvement; reduced wave energy; groundwater recharge; recreational opportunities; and sediment delivery. Task 1: Development and disseminate data, information and tools to assist the site selection and design of multi-objective projects, as part of the currently ongoing Flood Control 2.0 Project Milestone: Regional "toolbox" available online by 2016 Task 2: Use findings of various on-going projects, studies, research, and analyses to identify and select initial sites. Assess existing conditions against historic and projected conditions (including sea level rise) to develop appropriate project scopes and conceptual restoration designs for selected sites. Milestone: Project scopes and conceptual restoration designs for four sites by 2018 Task 3: Outreach to appropriate property owners and public entities to further develop restoration approach, permitting, and funding strategies. Milestone: Strategies for permitting and funding for four sites by 2019 Task 4: Secure funding from responsible parties (and grant programs as needed) to complete designs and construction documents and obtain necessary permits and approvals Milestone: Initiate implementation phase of two projects by 2021 Task 5: Develop a single integrated flood protection and floodplain habitat enhancement project for the Yolo Bypass. Milestone: Release an environmental document for an integrated Yolo Bypass project by 2017
BACKGROUND	The Estuary's connections to local creeks are integral to its health. Historically, these were the Estuary's natural deltas; places of high ecological diversity and complexity. These locations play a disproportionately important role in the sustenance of the Estuary's tidal marshlands, as the delivery points for watershed carbon and sediment. Over time these transition zones have been arrayed with levees, berms, transportation structures, and culverts that disrupt the natural hydrologic exchange and sediment delivery regimes that nourish complex habitat mosaics for native wildlife. In urbanized watersheds, it is not uncommon to find creeks connecting to the Bay through open or closed culverts. Historic patterns of interstate trade, travel, and parcel level development has infringed on lower watershed creek channel geomorphology and access to natural floodplains. With most urban watersheds fully developing after the placements of transportation infrastructure crossing local waterways, both ecological functions and community safety are impaired by hydraulic constrictions. By redesigning the tidal-fluvial interface we can supply sediment to re-create critical habitat features along marsh fronts, historic tributary deltas, and beaches, while simultaneously improving flood conveyance and re-establishing more resilient shorelines. Incorporating restoration of various habitat types including riparian, marsh and subtidal and intertidal habitats such as eelgrass and oyster beds can provide for additional ecosystem services including shoreline stabilization, water quality improvements and dampening of wave energy .Restoring natural floodplains can increase habitat, improve flood conveyance and recharge groundwater.

ACTION 14 **Manage sediment on a regional scale and advance beneficial reuse**	ACTION DESCRIPTION: Manage sediment comprehensively on a regional scale to assess Bay sediment processes, assesses human activities affecting sediment processes and includes best practices and an overarching strategy to manage human activities to enhance Estuary habitats. Task 1: Identify funds and conduct research and monitoring to quantify all potential sediment sources to the Estuary and determine the sediment needs for maintaining current marshes, mudflats and managed ponds under various sea level rise projections. Milestone: Study complete by 2017 Task 3: Strengthen the Long Term Management Strategy (LTMS) policies on beneficial reuse of dredged material by expanding the current "Sedi-Match" project's efforts to resolve logistical issues and match habitat projects and dredging/upland construction projects. Milestone: Expanded and improved Sedi-Match by 2017 Task 4: Identify funding to pay the differential between least cost disposal methods and for offloaders to pump material to beneficial reuse sites. Milestone: Funding identified by 2017 Task 5: Identify funding and owner and undertake a pilot study for "seeding the mudflat." Experiment with placement of dredged material onto the Bay bottom and tracking its distribution into restored areas and existing marshes, and analyze potential negative effects on benthic environments. Milestone: Funding identified and pilot study complete by 2021 Task 6: Advance understanding of sand beach creation and sustainable replenishment projects as habitat for multiple species and as a shoreline erosion control and sea level rise adaptation strategy. Create (or enhance an existing) monitoring tool to identify potential sites for sand beach creation or replenishment projects and track completed projects. Use the tool to identify possible sites for a pilot project, and advance information about sand beaches to regulators and restoration community. Milestones: Release of monitoring and tracking tool by 2017; identify and pilot project location, coarse grain sediment source(s), and funds for implementation and begin implementation of pilot project by 2021; release of published materials, workshops, and presentations on sand beaches by 2020.
BACKGROUND	Estuary research has identified a recent significant decline in sediment supply to the Bay from the Delta. This decline has potential impacts to existing shorelines, beaches and marshes and implications for changed conditions in the water column. Management practices should be reconsidered, and potentially changed, to take advantage of the sediment activities that are ongoing to the benefit of ecological and human activities. Subsided wetlands need to be restored for the ecological health of the estuary, flood protection, to stabilize endangered species populations and to provide wildlife habitat. The ability to complete the direct placement of sediments on this restoration is a documented successful technique to accomplish the site's restoration goals. Sediment sources can include dredged sediment from flood control and/or navigation channels, as well as terrestrial sources. Research on sediment dynamics is needed, as are pilot projects to better understand beneficial reuse and dispersal of sediment. Challenges with beneficial reuse include identification of sources, cost, and current regulatory framework. In addition, better coordination of projects that result in dredged or excavated sediment and restoration projects that need sediment is needed. "Sedi-Match," an outcome of the Flood Control 2.0 Project, includes a website to match projects as well as a forum to work through challenges of beneficial reuse of sediment. Sedi-Match can be further improved and expanded with further funding to better accomplish its goals.

ACTION 15 **Demonstrate how restored habitats serve as "natural infrastructure" that provide multiple benefits**	ACTION DESCRIPTION: Identify and help implement projects that demonstrate how tidal habitats and other ecosystems can serve as "natural infrastructure" to make the region more resilient to environmental stresses such as rising sea level, more frequent droughts, and water pollution. Clarify areas where ecosystem restoration can provide the most benefits, both independently and in hybrid applications with traditional engineering approaches, including shoreline protection, flood management, water storage, or wastewater treatment. Task 1: Develop a "primer" that describes how Bay projects can consider designs that optimize multiple benefits (flood protection, water quality, habitat restoration, recreation) rather than the traditional approach of single purpose projects. Milestones: Develop primer and implement outreach strategy for primer by 2016; Develop interim guiding principles for new projects, integrating multi-benefit approaches with existing guidance, plans, policies and regulations by 2017 Task 2: Develop best practices and design guidelines for natural infrastructure and hybrid approaches to designing working infrastructure that is integrated with habitat that can be used to develop projects that increase the resiliency and multiple benefits in regional ecosystems. Develop a system of shoreline typologies, and projections of future environmental conditions, that can be used to determine initial suitability of various best practices. Include guidance relating to cost and permitting, and develop a strategy for mainstreaming these practices. Milestones: Develop best practices guidelines by 2017; Develop system of shoreline typologies, and use this to determine the suitability of various best practices among the different shoreline typologies by 2017; Integrate recommendations regarding suitability of various practices by typology into the guidelines by 2017 Task 3: Create a vision for the shoreline that embodies the expected evolution of the Estuary, the natural values it provides, and the needs and constraints of urban development (example is the Novato Creek Vision produced by SFEI). Overlay this vision onto the typologies developed in Task 2 to map the vision for particular reaches/watersheds, and use these maps to engage stakeholders. Milestones: Develop a vision for a specific section of shoreline and its watershed that integrates natural infrastructure, human development, and landscape processes by 2017; Present vision to local decision-makers and revise vision by 2018; Develop brief "how-to" manual for applying approach to other locations by 2018 Task 4: Construct pilot projects to test and refine natural infrastructure approaches by applying the guidelines developed in Task 2. These pilot projects will verify the performance of multi-benefit restoration designs, and will include budget for monitoring, evaluation, and subsequent design refinement. Milestone: Identify, design, permit and implement three additional pilot projects in the Bay by 2021; update regional guidelines by 2021
BACKGROUND	"Natural infrastructure," sometimes also known as "green infrastructure" consists of a range of strategies that leverage natural processes to provide multiple benefits —such as flood protection, aquatic habitat, water quality, and carbon sequestration" – from preservation of natural systems to combinations of ecological restoration and engineered structures. Specific approaches to wetlands restoration, living shorelines, horizontal levees, construction of high tide refuge islands, and active revegetation projects are all examples of natural infrastructure that can provide multiple biological and physical benefits.

ACTION 16 **Advance natural resource protection while increasing resiliency of shoreline communities**	ACTION DESCRIPTION: Advance protection of natural resources while undertaking work to increase the resilience of shoreline communities as risk from flooding and sea level rise. Task 1: Support local governments' efforts to develop shoreline vulnerability assessments that include assessment of natural resources as an asset category. Milestone: Completion of vulnerability assessments for all 9 counties in the Bay Area by 2021 Task 2: Integrate resiliency into Plan Bay Area (Sustainable Communities Strategy) that includes protection of natural resources, laying the groundwork for a more comprehensive regional resilience/adaptation effort. Milestone: Completion of resiliency chapter in Plan Bay Area by 2017 Task 3: Coordinate climate technical assistance programs to improve service to cities and counties and other key stakeholders and promote consistent quality and best practices in climate planning and implementation Milestone: Formation of multi-stakeholder Bay Area Climate Technical Assistance Task Force and development of work plan for coordinated climate technical assistance by 2016 Task 4: Coordinate deployment of grant resources in a coordinated and strategic manner, and to the highest and best use in advancing effective local and regional strategies to mitigate climate change and address climate impacts. Milestone: Report on coordinated efforts at BARC meetings - ongoing
BACKGROUND	The Bay Area Regional Collaborative (BARC) is a consortium of member agencies including the Bay Conservation and Development Commission (BCDC), the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC) and the Bay Area Air Quality Management District (BAAQMD), that come together to address crosscutting issues of regional significance, with the ultimate goal of improving the quality of life for all Bay Area residents. The Bay Area Regional Collaborative provides a mechanism through which its member agencies can learn, explore, collaborate, incubate, coordinate, and communicate policies and best practices that agency leadership can decide to advance collectively and singularly, and in partnership with other local and regional stakeholders. Each of the Bay Area's regional agencies is deeply engaged in work to mitigate climate change and make the Bay Area more resilient to the impacts of a changing climate. The agencies are working together to create coordinated policies, increase efficiencies, leverage resources, and provide better services to local governments and special districts that are grappling with these issues. This collaborative work provides clear distinctions among the different roles and responsibilities of the four agencies in relation to climate; fosters linkages between regional, state, and federal programs; and communicates outcomes in a clear and coherent manner to regional stakeholders. BARC and its member agencies have joined in partnership with the California State Coastal Conservancy (SCC) to develop a shared understanding of local and regional risks and vulnerabilities to flooding and rising sea levels, while also developing – working closely with a broad and diverse range of local and regional stakeholders – the appropriate strategies and approaches, at the appropriate scales, to making our regional more resilient to a changing climate.

ACTION 17 **Integrate natural resource protection into local government hazard mitigation, response, and recovery planning**	ACTION DESCRIPTION: Provide technical support and resources that assists local governments in integrating natural resources into hazard mitigation, response, and recovery planning that results in planning, response and recovery plans that adequately consider the value of local natural resources for providing multiple benefits including habitat and flood protection. Task 1: Complete hazard mitigation plans (in some cases integrated with climate adaptation plans) that include specific actions to protect natural resources and consider natural resources as protective functions that reduce hazard impacts and increase resiliency. Provide assistance as necessary to local governments to identify and assess natural resources as an asset. Milestone: Completion of twenty local (city or county) hazard mitigation plans that include natural resources as an asset category by 2021 Task 2: Completion of Disaster Recovery Plans that include Recovery Support Functions (modeled on FEMA's NDRF) for natural resources Milestone: Completion of ten local (city or county) Disaster Recovery Plans that include a Recovery Support Function for natural resources by 2021
BACKGROUND	Natural resources such as subtidal habitats, tidal marshes, and floodplains provide many important ecological services, including flood risk management. In addition, natural resources may be impacted by hazard events themselves as well as response and recovery efforts. The Federal Emergency Management Agency (FEMA) has developed a series of guides under a National Preparedness System. The objective of the guides is to achieve a shared understanding and a common, integrated perspective across all mission areas—Prevention, Protection, Mitigation, Response, and Recovery. FEMA's *National Mitigation Framework* points out that community resilience depends in part on "recognizing and communicating the reinforcing relationships between environmental stewardship and natural hazard risk reduction (e.g., enhancement of flood storage through wetland protection/restoration and holistic floodplain management)." In addition, FEMA is now integrating consideration of climate change into the Preparedness System. The Association of Bay Area Governments (ABAG) and the San Francisco Bay Conservation and Development Commission (BCDC) are working with Bay Area cities and counties to develop and update local resilience plans, aligning hazard mitigation, climate adaptation, and general plans. ABAG and BCDC are providing technical assistance to streamline the planning process and allow jurisdictions to more quickly get to implementation of identified actions. ABAG and BCDC are working to incorporating natural resources as an asset category to be assessed in terms of vulnerability and risk for both climate adaptation and hazard mitigation. FEMA's *National Disaster Recovery Framework* (NDRF) is a guide to promote effective recovery from incidents. The NDRF identifies "Recovery Support Functions" (RSFs) to provide a structure to facilitate problem solving, improve access to resources, and foster coordination among State and Federal agencies, nongovernmental partners and stakeholders. The NDRF identifies "Natural and Cultural Resources" as one of six RSFs. The core recovery capability for natural and cultural resources, as described by the NDRF, is the ability to protect the resources through response and recovery actions, and to restore them as necessary post-disaster. In general, the expected outcomes for the Natural and Cultural Resources RSF is the integration of management and protection of natural and cultural resources into recovery. FEMA's guidelines provide a useful framework for hazard planning at the local level. Some Bay Area cities, such as Oakland, are currently engaged in using the NDRF as a framework to help them develop the City's Recovery Plan, which includes a section focused on Natural Resources.

ACTION 18 **Improve regulatory processes regarding permitting and monitoring innovative multi-benefit projects**	ACTION DESCRIPTION: Support and assist with efforts of others to encourage state and federal permitting agencies to better coordinate in light of new approaches due to need to adapt to climate change, and to adjust out-of-date policies and practices where critical and feasible. Task 1: Identify opportunities and recommendations for improved regulatory processes for multi-benefit flood control and habitat restoration projects through the Flood Control 2.0 project that is already underway. Milestone: Regulatory guidance and recommendations reports, workshops and podcasts by 2016 Task 2: Analyze current San Francisco Bay Conservation and Development Commission policies on fill in the Bay in light of sea level rise and the need for adaptation strategies, and revise as necessary. Milestone: Revised BCDC policies by 2021 Task 3: Bring major permitting agencies together to develop a decision-making process that helps reduce time and conflicts for multi-species and multi-benefit projects over a long time frame. Provide examples and case studies of successful multi-benefit projects to agencies and work with regulatory agencies to get good information in front of them. Providing a roadmap--including the regulatory agencies with developing that roadmap. Milestone: Identify convener and funder and institute a twice yearly workshop by 2017
BACKGROUND	Given the need to create resiliency to climate change with projects that meet multiple benefits, project proponents and regulatory agencies must better align their practices and identify opportunities to improve processes that may be cumbersome, conflicting, or out-of-date. Managing sediment on a watershed scale is an example of an emerging challenge. Innovations and varied approaches to the existing restoration process and regulatory frameworks will likely be necessary in order to facilitate the availability of sediment where it is needed to sustain tidal marshes. A high-priority example of this is the redesign of flood-control channels to allow for natural processes to move sediment from channels (where it impedes capacity) to the baylands (where it is needed). How we take full advantage of other sources of sediment in the system, such as navigational dredging projects, will be critical to address as well. Addressing such challenges will require a comprehensive analysis of the specific regulatory challenges paired with an understanding of the distinctions among agency historical practices (cultural norms), internal agency guidelines, enforceable policies, and laws and regulations. Certain regulatory challenges may be resolved on a shorter time frame through modifications within the existing regulatory frameworks. Other challenges may require a longer-term process that includes revisions to laws and enforceable policies. Ongoing regional coordination among regulatory agencies and the scientific community is critical to both identify challenges and to develop a broad consensus for solutions that can lead to these refinements in policy and permitting. Potential opportunities to improve the processes may include; better coordination between project proponents and regulatory agencies as well as among the regulatory agencies; and revised policies or regulations that address climate change and the need for adaptation strategies, including the use of fill in the Estuary and the flexibility for experimental designs and adaptive management.

ACTION 19 **Develop long-term drought plans**	ACTION DESCRIPTION**:** Revise Urban Water Management Plans to include a water shortage contingency plan (WSCP) for multi-year drought planning to meet DWR's UWMP requirements, including drought planning that: 1) addresses the hydrologic conditions of the service area; 2) includes planning for multiple scenarios, including multi-year droughts of 5-10 years; and 3) documents efforts to implement programs and investments that will help the Estuary respond to future extended droughts at the individual agency level and through multi-agency coordination efforts such as the Bay Area Regional Reliability feasibility studies and Integrated Regional Water Management Planning. Task 1: Analyze/summarize multi-year drought planning scenarios in all final 2016 Bay-Delta UWMPs. Milestone: Analyze 2016 UWMPs by July 2017 Task 2: Bay Area Water Agencies Coalition collaborates with DWR and climatologists to develop at least two recommended multi-year drought scenarios for 2020 UWMP planning efforts, including one severe drought and at least one multi-year drought scenario of 5-10 years. Milestone: At least two recommended multi-year drought scenarios for 2020 UWMPs by 2019. Task 3: Include revised multi-year drought scenarios in DWR's State Water Project Delivery Reliability Report by 2019-2020 UWMPs. Milestone: Issuance of 2020 DWR UWMP updated guidance document by 2020. Task 4: Include revised multi-year drought scenarios in 2020 UWMP updates prepared by Bay Area agencies and filing of final UWMPs by Bay Area agencies. Milestone: Final 2020 UWMPs filed by Bay Area agencies, including revised multi-year drought scenarios, by 2021.
BACKGROUND	Urban Water Management Plans (UWMPs) are prepared by California's urban water suppliers to support their long-term resource planning, and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 acre-feet of water annually, or serves more than 3,000 urban connections, is required to assess the reliability of its water sources over a 20-year planning horizon, and report its progress on 20% reduction in per-capita urban water consumption by the year 2020, as required in the Water Conservation Bill of 2009 (SBX7-7). The plans must be prepared every 5 years and submitted to the Department of Water Resources (DWR). Currently the draft guidance document for the 2015 update of these plans calls for an analysis of district plans in the event of a year multi-year drought of up to 36 months. Most Bay Area UWMPs include a three-year drought as the drought cycle. Final 2015 UWMPs must be submitted by July 1, 2016. Since California is already in the fourth year of a drought cycle, UWMPs should address actions that would be necessary to respond to long-term drought of five to ten years in duration. Climate change is anticipated to make California's climate more variable in the future, increasing the frequency of both droughts and floods, and reducing average Sierra Nevada snowpack. Local and regional drought planning should consider impacts to fish and wildlife resources, businesses, regional agriculture and communities, including the most vulnerable communities.

ACTION 20 **Reduce Bay Area landscape water use**	ACTION DESCRIPTION: Help facilitate actions by the regional water supply agencies to reduce municipal and residential potable and potential potable water use for landscapes, using tools such as local ordinances, incentive programs, and public outreach efforts. This action takes a multi-pronged approach to assist local municipalities in efforts to reduce outdoor water use and calls for a region-wide reduction in overall water use of 50%, using the state's per capita baseline date, by 2020. Reductions in landscape water use must be tied to offset of potable and potential potable water use, including potable water supplies sourced from imported water, groundwater, and local instream flow. Task 1: Using the latest technology and available real-time information, work with large and small water districts, local water agencies, DWR, large and small municipalities, and other partners to develop a standardized approach to methodology and reporting on outdoor urban water use. Milestone: Standardized methodology and reporting approach in place by June 2017 Task 2: Evaluate efficacy of current programs regionally and at the state level; work with appropriate local partners to identify gaps in current messaging and to identify actions that will amplify key effective messages in the Bay-Delta region. Milestone: Report complete by June 2016 Task 3: Sponsor development and expansion of local or regional water efficient landscape training programs, using models such as the California Friendly Landscape Training Program and Bay-Friendly Landscape Program. Milestone: Additional training programs launched by June 2017 Task 4: Work with land use agencies to ensure the implementation of existing landscape efficiency standards such as local Water Efficient Landscape Ordinances (WELO),Bay-Friendly ordinances, and CalGreen updates; encourage modification of local WELO ordinances to include landscapes under 2500 sq. ft. Milestones: Implement efficiency standards by June 2017; WELO ordinances modified by 2017 Task 5: Determine how best to work with local water agencies to expand or develop incentive programs such as lawn-to-garden or "cash-for-grass" rebates, stormwater capture, grey water reuse and other on-site reuse implementation for both residential and commercial water use. Milestone: Analysis complete by February 2017
BACKGROUND	Outdoor water use is responsible for up to 60% of total water use in the urban environment, particularly in inland portions of the region. Existing state law calls for 20% reduction in *per capita* water use by 2020. However many parts of our region have already met the 20% by 2020 goal, or are very close to doing so, therefore the state-mandated reduction in per capita use is no longer an aggressive goal for many Bay Area agencies. While there is still some room to improve in the region on indoor water use (additional low-flow toilets, shower heads, leak detection, etc.), getting to the next level of per capita reduction will require a focused reduction in outdoor water use. Work is needed to transform California's urban landscapes as part of a larger effort in watershed-appropriate landscaping. Achieved reductions in outdoor water use should offset potable and potential potable water use. This action has been identified in the California Water Action Plan, Executive Order B-29-15, Wetter or Not, and has been written into state law through the Water Conservation in Landscaping Act of 2006 (AB 1881). On July 15, 2015, the California Water Commission approved a revised Model Water Efficient Landscape Ordinance. Local agencies have until December 1, 2015 to adopt the revised ordinance or adopt their own equivalent ordinance. The revised ordinance applies to landscapes over 500 sq. ft. and rehabilitated landscapes of over 2,500 sq. ft.

ACTION 21 **Increase water recycling**	ACTION DESCRIPTION: Increase the percentage of recycled wastewater produced by Estuary wastewater treatment plants as an offset of potable and potential potable water supply. Limiting factors in developing recycled water up to now include project costs and funding limitations, market demand, and customer/public acceptance. Efforts will focus on building public acceptance for more use of recycled water and continuing to work with regional partners to secure funds to create new recycled water projects. Task 1: Develop with appropriate partners a report that sets a vision and plan of action for a more ambitious approach to water recycling in the Bay Area. Milestone: Report completed December 2016 Task 2: In partnership with local water agencies develop a long-term regional strategy as part of the next Bay Area Integrated Regional Water Management Program (IRWMP) to reach the identified potential of 25% reuse of current wastewater discharges by 2020 and 50% reuse by 2030 for the Estuary region. Include a sound accounting methodology for recycled water use data reporting in the strategy. Identify potential emerging issues with increase reuse of treated wastewater, such as increases in reverse osmosis concentrate and unknown constituents. Milestone: Strategy complete by June 2017 Task 3: Water recycling feasibility studies should be completed by each publicly owned treatment works, municipality, and/or water district. These feasibility studies should investigate a full range of recycling options and should be undertaken collaboratively with water supply agencies. Milestone: Ongoing Task 4: To the extent practical, use existing facilities and develop new treatment and conveyance facilities to deliver recycled water for beneficial reuse. Milestone: 2019 Task 5: Municipalities and counties should adopt water recycling ordinances and code changes encouraging the use of recycled water for all state-approved uses while providing for the protection of public health and the environment. San Francisco's new ordinance regarding water recycling and new construction is one possible model. Milestone: Immediately Task 6: Local entities should develop and conduct public education programs to increase public acceptance of use of recycled water for appropriate water quality applications currently underway. Milestone: Immediately
BACKGROUND	Despite the Bay Area's dependence on imported water, up to now its relatively high reliability and low cost has inhibited the use of recycled water. Recycled water use is a small but an increasingly important part of the Bay Area's water portfolio. The region, however, has not been able to achieve targets and projections for its use and lags other urbanized regions of the State in both quantity used and percentage of demand. Current recycled water use has reached 70% of the projections made in 2010, and 40% of the ambitious but now outdated targets for 2010 established in 1999 by the Bay Area Regional Water Recycling Program. This shortfall in developing recycled water is due to project costs and funding limitations, market demand, and customer/public acceptance.

ACTION 22 **Change public's perception of the value of water to achieve long-term reduction in water use**	ACTION DESCRIPTION: Develop effective strategies to encourage people to be more aware of their water use, more motivated to manage that use, and to choose less consuming options as a long-term life style change. Task 1: Evaluate efficacy of current programs regionally and at the state level; work with appropriate local partners to identify gaps in current messaging and to identify actions that will amplify key effective messages in the Bay-Delta region. Milestone: Report complete by July 2016 Task 2: Implement social 'norming' messages through social media and other delivery methods identified with partners; test new messages to address identified gaps. Milestone: Messaged delivered by December 2016 Task 3: Design and implement an annual survey to assess public perception of the value of water. Milestone: Survey implemented by May 2017 Task 4: Assess effectiveness of new messages and effectiveness of social media and other delivery methods of key messages; revise campaign in collaboration with local partners as necessary. Milestones: Assessment completed by October 2019; Campaign revised by 2019
BACKGROUND	An effective water conservation campaign will require stable funding and should be designed for maximum impact. Examples of programs include statewide programs such as DWR/ACWA's "Save our Water" campaign and other state and regional behavioral change efforts and examples from other states like Denver Water's "don't be that guy" campaign. Determine which ones are most effective for CCMP related messages and support through social media, print, event and other avenues. California must fundamentally alter its relationship with water. The current drought highlights the need for comprehensive action to ensure that we have water policies and supplies that protect both our economy and environment in the near future and during our periodic and inevitable future drought periods. Over-allocation of surface water, sever groundwater overdraft, and the sharp decline of many of our aquatic ecosystems bring us to the conclusion that California water demands exceeds safe supply. The state has experienced extended droughts in the 1930s and 1990s –paleo climate analysis shows that California has endured server droughts of much longer length than 3-5 years. Helping Californians to understand and embrace new water saving ways of doing business, at home, in business and in our communities are needed.

ACTION 23 **Promote potable reuse with regional agencies and following state lead, standards for direct potable reuse**	ACTION DESCRIPTION: Promote investigation and future application of potable reuse in the region among water and wastewater agencies, NOG's and the community, and coordinate with ongoing State Water Board efforts towards standards and public acceptance of direct potable reuse. Assist the relevant state agencies in completing and adopting consistent regulations for direct potable reuse. Promote and support efforts at the regional level to create a vision and road map identifying key challenges and opportunities to further implementation of potable reuse. Support workshops with water and wastewater agencies, NGOs, National Water Research Institute (NWRI), WaterReuse, AWWA and other stakeholders to assist with road map development. [*This action is linked to Actions 22 and 29*]. Task 1: Coordinate with local agencies, State Water Resources Control Board and foundations to fund and produce a report that describes ways to expand the use of recycled water as part of indirect and direct potable reuse. To be done in coordination with on-going state and regional efforts to bring indirect potable reuse regulations forward and to investigate the potential for direct potable reuse. Milestone: Report completed by September 2016 Task 2: Help regional agencies develop a road map identifying key challenges and opportunities to maximize regional potable reuse. Milestone: BAWAC road map by 2016 Task 3: Facilitate information and outreach to increase public understanding and acceptance of potable reuse. Milestone: Ongoing
BACKGROUND	Indirect potable reuse (IPR) refers to the use of treated and purified wastewater to augment drinking water supplies through an environmental buffer, such as injection into an underground aquifer. Direct potable reuse (DPR) refers to the introduction of purified water, derived from municipal wastewater after extensive treatment and monitoring to assure that strict water quality requirements are met, directly into a municipal water supply system. Such purified water could be blended with source water for further water treatment or even direct pipe-to-pipe blending of purified water and potable water. DPR offers the opportunity to significantly reduce the distance that purified water would need to be pumped thereby reducing costs. It also has the potential to dramatically expand use of recycled water. Public acceptance is the most important element of adoption of DPR and key to getting public acceptance is aggressive source control of pharmaceuticals and other Constituents of Emerging Concern (CECs). In 2011, the State Water Resources Control Board contracted the Southern California Coastal Water Research Project to establish and manage a team of investigators to develop bioassays to identify known and unknown CECs that may potentially be found in recycled water titled *Development of Bioanalytical Techniques for Monitoring CECs in Recycled Water Applications for the State of California*. Ensuring that the use of treated wastewater does not result in adverse health effects requires a systematic science-based approach and a thorough evaluation of the best practices that will protect public health, and consideration of environmental and sociocultural concerns. The Silicon Valley Advanced Water Purification Center provides a local example of successful demonstration of advanced technologies used for water treatment and purification and which can be used for future successful Bay Area IPR projects to recharge groundwater, augment water supplies and prevent subsidence.

ACTION 24 **Assess potential application of the constitutional standard of waste and unreasonable use in the Estuary**	ACTION DESCRIPTION: Conduct a careful review of the waste and unreasonable use doctrine in the context of evolving California and western water law and the need to use this Public Trust resource wisely. Based on the review, make strategic recommendations to the State Water Resources Control Board on what aspects of the doctrine should be considered for possible Board consideration. Task 1: Fund and complete an expert legal evaluation to determine the potential for further application of the waste and unreasonable use doctrine within the context of public trust law and the State Board's existing authority. Milestone: Evaluation complete by December 2016 Task 2: Develop a series of recommendations to implement the findings of the report. Milestone: Recommendations by June 2017
BACKGROUND	California's constitution, as in most western state constitutions, prohibits waste and unreasonable use of water; however, this doctrine is rarely used to curtail water use or application methods. Article X, Section 2 of the California Constitution and various provisions of the California Water Code provide the basic authority to halt unreasonable water use. Among the factors that have limited the use of these provisions are the administrative hurdles that must be crossed to make the case for unreasonable use. A thorough review of the doctrine should be conducted and recommendations made to the state regarding what aspects of the doctrine could be considered for further development and application. This review should consider actions such as creation by the State Water Resources Control Board (SWRCB) of a new "Reasonable Water Use" unit, with already-established enforcement positions. The Report could also consider if the SWRCB could assisting farmers and water districts to transfer conserved irrigation water or make it available for instream use. The 2011 Delta Watermaster Report titled "Reasonable Use Doctrine & Agricultural Water Use Efficiency" makes this recommendation. The 2011 report also proposes that the SWRCB convene a Reasonable Water Use Summit and/or hearings on the Delta Watermaster's recommendations. The SWRCB's ability to use its reasonable use authority was tested recently in a lawsuit regarding the Board's regulation of diversions for frost protection purposes in the Russian River watershed. In October 2014, the California Supreme Court declined to hear this case, letting stand a Court of Appeals ruling that upheld the SWRCB's reasonable use authority.

ACTION 25 **Integrate water into the updated Plan Bay Area and Delta Sustainable Communities Strategies**	ACTION DESCRIPTION: Expand the focus of the update for Plan Bay Area to incorporate a full range of issues related to water and San Francisco Bay. Regional planning efforts related to transportation, housing and greenhouse gas (GHG) reduction should incorporate related water issues, including water quality, stormwater management (Low Impact Development or LID/green infrastructure), landscape water use, reducing per capita water use, maximizing opportunities for water recycling and drought preparedness. Task 1: SFEP coordinate with ABAG, MTC, and others to create a strategy to more strongly incorporate water and SF Bay-related issues into Plan Bay Area updates. Milestone: Strategy complete by June 2016 Task 2: Using the Plan Bay Area update process as a model, evaluate opportunities to take similar action with Sustainable Communities Strategies in the Delta region. Milestone: Report complete by June 2018
BACKGROUND	SB 375 and its requirement for Sustainable Communities Strategies is an important step forward in integrating GHG reduction, transportation, land use and housing issues into metropolitan planning processes. However, it did not fully address water or resource protection issues. Plan Bay Area is a long-range integrated transportation and land-use/housing strategy through 2040 for the San Francisco Bay Area. The 2013 Plan was jointly approved by the Association of Bay Area Governments (ABAG) Executive Board and by the Metropolitan Transportation Commission (MTC). The Plan includes the region's Sustainable Communities Strategy and the 2040 Regional Transportation Plan. The update of Plan Bay Area is anticipated in 2017, presenting an important opportunity for the Bay Area to demonstrate the benefits of integrating water issues into the SB 375 process. Sustainable Communities Strategies in the Delta also offer the opportunity for integration of water and resource protection issues. Through an integrated approach, the updated Plan Bay Area will identify strategies that provide water-related co-benefits. For example, new transportation projects will be designed to produce stormwater management benefits. Infill development presents opportunities for green infrastructure as well as greywater and recycled water use. Infill projects will also contribute to efforts to reduce per capita water use and prepare for future droughts.

ACTION 26 **Adopt new Bay-Delta freshwater inflow/outflow standards that better protect all beneficial uses**	ACTION DESCRIPTION: With partners, help educate elected officials and the public on the critical importance of freshwater outflow* to the health of the San Francisco Bay-Delta estuary. In combination with other CCMP actions, work to restore and enhance critical freshwater flows in rivers and tributaries throughout the estuary. Task 1: Work with partners on report highlighting the role of freshwater flows in the lower portion of the estuary-- San Francisco Bay. Milestone: Report complete by 2016 Task 2: Assist the State Water Resources Control Board in updating the San Francisco Bay/Sacramento-San Joaquin River Delta Water Quality Control Plan (Bay-Delta WQCP) by providing clear, concise, scientifically sound data to the State Board during its deliberations and by keeping the public and local officials informed about opportunities to participate. Milestone: Completion of the updated Bay-Delta WQCP with updated flow objectives by 2021. Task 3: Assist the Delta Science Program in their work to bring sound science to these issues by supporting their expert panels and other administrative tasks. Milestone: Ongoing **Outflow includes amount, timing, and duration needed to support healthy tributary rivers, creeks, streams and waters of the estuary*.
BACKGROUND	According to the Delta Plan, "The Delta is the upstream portion of the San Francisco Estuary, where ecosystems dominated by the Central Valley's rivers transition to the more ocean-influenced ecosystem of the downstream portions of the estuary. Water flow is a "master variable", driving the ecological health of rivers and their ability to support valued environmental services (Poff et al. 1997, Postel and Richter 2003). In estuaries, the interaction of river flows and ocean tides produces a salinity gradient from fresh water to brackish and salty water. River flows and ocean tides also deposit and erode sediment to shape the estuarine landscape and its habitats. Estuarine species are adapted to the complex natural flow, salinity, and sediment dynamics in their native estuaries." The lack of adequate freshwater flows, timing, and duration is currently insufficient to support a healthy estuary and has been noted in many reports and investigations (2010 State Water Resources Control Board Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem). The State Water Resources Control Board (SWRCB) is now updating its Bay-Delta WQCP in multiple phases. The first phase focuses on water quality objectives for the south Delta and flow objectives for the lower San Joaquin River and its three major tributaries The second phase focuses on other changes to protect fish and wildlife and other beneficial uses not addressed in Phase 1, including updates to Delta outflow objectives. Multiple federal and state regulatory agencies have commented on the need for improvements to the SWRCB's 1995 Bay-Delta standards for freshwater flows, including the California Department of Fish and Wildlife, National Marine Fisheries Service, U.S. Environmental Protection Agency, and U.S. Department of the Interior. This action is focused on the work that SFEP and its partners can achieve to support the larger goals of the state consistent with the work of the SWRCB, the Governor's California Water Action Plan, the Delta Plan and other key efforts to bring about needed changes to urban, industrial and agricultural water use so that the fundamental ecosystem processes of the estuary can be restored. One key first task is to highlight the importance of freshwater to the lower portion of the estuary—the Bay proper --as there has been limited focus on this portion of the Estuary relative to its need for freshwater inflows.

ACTION 27 **Increase regional agriculture water use efficiency**	ACTION DESCRIPTION: Assess opportunities to improve agricultural water use efficiency practices in the region and, with partners, expand implementation of water use efficiency methods with intent to ensure conserved water goes to instream uses. In two areas in the Bay-Delta region, a tributary watershed and a portion of the Delta, assess current agricultural water use methods. Evaluate current practices against the range of applicable water use efficiency methods and management practices available for each area, recognizing site feasibility and geographic constraints and possible barriers to greater water conservation. The report will also outline the mechanisms by which conserved water could be secured for instream uses. Task 1: Establish an advisory group for the assessment, select pilot sites and secure a contractor Milestone: December 2016 Task 2: Review potential agricultural water use efficiency practices with Advisory Team to bring BMPs to farmers through outreach efforts. Milestone: Report complete by June 2017 Task 3: Complete report with recommendations on water-saving management practices and instream flow enhancement mechanisms and opportunities. Milestone: Report complete by December 2017
BACKGROUND	A number of independent studies conducted over the past 15 years (Pacific Institute, CALFED) have concluded that California agriculture presents an opportunity for significant water savings through changes to water management practices. These studies have surveyed the range of agriculture throughout California; however, the question remains: to what extent do these conclusions apply to agriculture in the Bay-Delta Estuary? Although agriculture throughout the Bay-Delta is highly variable, from crops to acreage to rainfall and soil distribution, it shares certain characteristics not found in other agricultural regions of the state: a temperate climate and powerful development pressure, for example. Water supply reliability is also generally higher for most parts of the Bay-Delta, in comparison to Central Valley agriculture. For these reasons, an assessment of Bay-Delta agricultural water use practices is needed to determine whether significant opportunities exist to conserve water for instream uses in the region. The use of two areas—a Bay Area tributary watershed and a designated area of the Delta—to conduct assessments will not capture the full range of agricultural variability in the region, but will provide a foundation for future assessments. The review will include programs such as the Sonoma and Napa RCD's mobile irrigation lab (MIL) in coordination with Sonoma RCD through the LandSmart® program. Some areas are already covered by vineyard and grazing waivers; therefore, working closely with the SF Bay Regional Water Quality Control Board on the implementation of those waivers will be essential. Advice will be sought from various expects including regional agricultural business associations, RCDs, Agricultural Extension Agents, the NRCS, local agricultural representatives, appropriate agencies, and NGO representatives. The selection of a Bay tributary watershed will include an evaluation of watersheds with high restoration potential for species such as steelhead. The resulting report will be a model for assessment of agricultural practices throughout the Bay and Delta and offer regionally-based, vetted information on the opportunities for, and barriers to, increased agricultural water conservation.

ACTION 28 **Identify and work to eliminate illegal water diversions in the San Francisco Bay region**	ACTION DESCRIPTION: Assist State Water Resources Control Board by working to identify and eliminate illegal diversions in the San Francisco Bay region. Work with Resource Conservation Districts and others with landowner-oriented programs on solutions to restore instream flows. Encourage responsible agencies to identify and take actions against illegal diverters. Task 1: Prepare a report that investigates whether this is a serious problem in San Francisco Bay region watersheds, with a focus on watersheds with high restoration potential for species such as steelhead trout. Milestone: Report complete by June 2017 Task 2: Take one sample San Francisco Bay region watershed and create an estimate of how much water is being diverted illegally. Use major tributary watersheds as candidates. This task will include a review of State Water Resources Control Board water rights. It will also include an effort to distinguish water users dependent on groundwater from those dependent on surface water. It will also propose a goal and timeframe for the reduction of identified illegal diversions. Milestone: Analysis and recommendations complete by June 2018
BACKGROUND	The focus of this action is on the tributary watersheds that drain into the San Francisco Bay and not the Delta. A diversion probe by the Delta Watermaster in 2011 resulted in the conclusion that most of the diversions in the Delta are legal riparian or pre-1914 water rights (Water Right Compliance and Enforcement in the Delta report). Illegal growing operations have already been identified as a serious problem in North Coast rivers. For example, in 2004 both the Eel and Mattole rivers ran dry due to drought and illegal diversions. The State Water Resources Control Board currently has 22 staff assigned to investigate illegal diversions. The California Department of Fish and Wildlife was recently given broader authority to crack down on illegal growing operations, and often conducts its own investigations and refers illegal diversions to the State Board. Law enforcement agencies have not yet formulated a statewide strategy to address illegal diversions in their jurisdictions; however, Mendocino and Lake counties have set up water theft hotlines. Illegal diversions are a serious issue in many parts of the state. Illegal marijuana growing operations are known to exist in more remote parts of Bay-draining watershed. This action will determine to what extent illegal diversions pose a threat to beneficial uses of watersheds in the San Francisco Bay region. *Action still under development*

ACTION 29 **Address emerging contaminants**	ACTION DESCRIPTION: Support and advance the existing regional contaminants of emerging concern (CECs) management strategy and action plans for specific CECs and the associated Regional Monitoring Program (RMP) CECs monitoring strategy. Support and expand existing education and public outreach efforts to reduce pharmaceutical and personal care product CECs. Task 1: Review and update CECs management strategy, CECs action plans, and CECs monitoring strategy no less than every two years. Milestones: Reviews and updates completed in 2016, 2018, 2020 Task 2: Coordinate with and track efforts by the CA California Department of Toxics Substances Control (DTSC) to manage CECs via its safer consumer products regulations. Milestone: Ongoing and in accordance with CECs action plans Task 3: Support and expand pharmaceutical CECs reduction efforts like the Alameda County Safe Drug Disposal ordinance to other counties. Milestone: Draft model ordinance based on Alameda County Safe Drug Disposal ordinance by December 2016 and encourage adoption by other counties. Task 4: Create and evaluate the effectiveness of an education program aimed at reducing or eliminating the use of a personal care product CEC, such as triclosan. Milestone: Create program by 2017; evaluate effectiveness by 2020 Task 5: Expand Cradle-to-Cradle certification program in Bay-Delta Estuary. Milestone: Certification program expanded by 2021
BACKGROUND	Over 100,000 chemicals have been registered or approved for commercial use in the United States, and chemical production is growing globally. Major information gaps on these chemicals limits the ability of scientists to assess their potential risk; as a result, many chemicals that have not been adequately tested for their potential impacts to humans and wildlife are continuously released into the environment, ultimately washing into aquatic ecosystems such as the San Francisco Bay. Some of these chemicals have been classified as contaminants of emerging concern (CECs). Characteristics used to identify CECs include high volume use, potential for toxicity in aquatic species, and occurrence in the environment. Determining which of the thousands of chemicals in commerce are CECs and whether or not they may be a problem is a formidable challenge. For the vast majority of chemicals in use today, the occurrence, persistence, and toxicity data needed to protect the beneficial uses of aquatic ecosystems are in short supply. Thanks largely to the Regional Monitoring Program (RMP), San Francisco Bay is one of the most thoroughly monitored aquatic ecosystems in the world with respect to CECs. CEC studies by the RMP and others have revealed the Bay to be a hotspot for contamination by certain substances, such as polybrominated diphenyl ethers (PBDEs) flame retardants and perfluorooctane sulfonate (PFOS) used in firefighting foams, coating additives and cleaning products. RMP studies are providing evidence that actions taken to reduce the uses of CECs and their input to the Bay can be effective in lowering concentrations in the Bay, as seen for PBDEs.

ACTION 30 **Decrease raw sewage discharges**	ACTION DESCRIPTION: Reduce the input of raw sewage into the estuary through enhanced sewer lateral repair programs and development of resources for marinas and recreational boaters to better manage sewage discharge. This effort will focus on providing management guidance for marinas, creating a mobile application for pumpout status reporting, and the research and implementation of a mobile pumpout pilot program that can be replicated throughout the San Francisco Bay and Delta. Task 1: Review number of sewer lateral repair ordinances currently in operation around the region. Milestone: Review complete by September 2016 Task 2: Target 30% of the uncovered jurisdictions for assistance with development and passage of a sewer ordinance modeled on exiting regional programs such as Berkeley and East Bay MUD. Milestone: Jurisdictions identified by December 2016 Task 3: Produce and promote a white paper that describes existing and potential funding mechanism for communities to pay for private sewer line repair and replacement such as financing strategies that allow residents to fix broken laterals and pay them back through sewer bill increases. Milestone: White paper complete by June 2017 Task 5: Publish an industry-supported, technically vetted Sewage Management Manual for Marinas. Milestone: Sewage Management Manual complete by 2019 Task 6: Develop an application for boaters to report broken pump-outs and marinas to report pump-out use and operational status; pilot a mobile pumpout program for marinas and recreational boaters in the Oakland Estuary. Milestone: Application and pilot program launched by 2017
BACKGROUND	Most of the sewage systems in the Bay Area are over 50 years old and in poor condition. General wear-and-tear and pressure from tree roots have caused pipes to crack over time. Cracks allow rain water to seep into the sanitary sewer system during storms (called inflow and infiltration, or I&I), which overloads the limited capacity of the treatment plants and leads to illegal discharges of raw sewage into the Bay. An analysis in 2010 found only 15 out of 115 wastewater agencies in the Bay Area have enacted sewer lateral ordinances. Draft ordinances have been developed by the North Bay Watershed Association and others that can be modeled by other jurisdictions. Financing for private sewer lateral upgrades can be an impediment to full implementation; alternative finance methods could speed replacement efforts and should be explored. Recreational boating practices have the potential to quickly and significantly affect water quality if proper management and pollution prevention practices are not followed. According to a Department of Boating and Waterways report (2011) over half of the vessels in the San Francisco Bay have a sewage system on board. These systems can be either discharged overboard, into the water, or pumped into a land based sewage system for treatment. When discharged overboard, this concentrated sewage has dramatic localized effects on water quality, especially in shallow or low-flush areas like marinas and harbors. Richardson Bay is the only water body in the region with a pathogen TMDL, passed in 2009. It cites vessel discharges as a significant potential source of pathogen pollution in the Bay. While outreach is a critical component of addressing this issue, a multi-pronged approach to reduce the likelihood of sewage discharge in the San Francisco Bay will be undertaken. This work will support marinas and boaters in properly managing sewage, and will ensure the facilities required to properly dispose the sewage are abundant and functional.

ACTION 31 **Manage stormwater with Low Impact Development/Green Infrastructure practices**	ACTION DESCRIPTION: Develop planning and tracking tools, technical materials, and policy recommendations, and financing strategy guidance to support expansion of Low Impact Development (LID)/Green Infrastructure (GI) practices by local and regional public agencies to reduce stormwater runoff pollutants discharged to local waterways and the Estuary. Task 1: Enhance all components of the LID planning tool, "GreenPlan-IT." Milestone: Refined GreenPlan-IT complete by June 2017 Task 2: Partner with local jurisdictions to analyze LID/GI potential in select areas using Green Plan-IT and integrate findings into relevant agency planning mechanisms and policies for adoption and implementation. Milestone: Jurisdictions identified and analysis complete by June 2017 Task 3: Develop and promote a comprehensive regional workplan that identifies key policies, documents, legislation, agencies, and specific actions needed for integrating green infrastructure with future climate change and transportation and other infrastructure investments within the region. Milestone: Workplan complete by March 2018 Task 4: Create and make available to municipalities and other interested parties, design tools for LID retrofits, such as: cost-effective, low maintenance Standard Design Details for LID retrofits of typical road configurations; unit cost estimates for both LID retrofit practices and non-LID standard street details; and "lessons learned" reports on previous grant- and/or local agency-funded LID retrofit projects. Milestone: Design tools complete and available by March 2018 Task 5: Create a GIS-based database to track completed LID/GI projects in the public and private realms; coordinate the database with TMDL accounting systems developed by other local partners to identify and quantify the load reduction benefits of LID/GI practices. Milestone: Database launched by June 2018 Task 6: Develop informational report on lessons learned and the current state of LID benefit knowledge. Milestone: Report complete by January 2021
BACKGROUND	Green Infrastructure/Low Impact Development is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product. Creating and then getting agencies to use the right tools is critical in transitioning the region to the widespread use of LID/GI techniques. While parcel-level new, and re-development by regulation is required to use certain LID/GI techniques for projects of a certain size, many public agency projects are not mandated to use these methods. With impervious sidewalks and streets typically representing 15-25% of land cover in many Bay Area cities, these features contribute greatly to urban runoff peak flows, volumes, and pollutant loads. The Water Board recognizes this condition and addresses it in MRP 2.0, which requires permittees to develop GI Action Plans, use GI/LID to capture PCB- and mercury-laden runoff, and track GI/LID implementation. Green Plan-IT is a planning level tool, created by SFEI in partnership with SFEP, to support the cost-effective selection and placement of Green Infrastructure (GI) at a watershed scale with three components: (a) a GIS-based Site Locator Tool; (b) a Modeling Tool that quantifies anticipated watershed-scale runoff and pollutant load reduction; and (c) an Optimization Tool to identify the best combinations of GI types and number of sites.

ACTION 32 **Implement select TMDLs**	***Action under development*** ACTION DESCRIPTION: While there are over a dozen Total Maximum Daily Load regulations completed or under development in the Estuary, this action focuses on those TMDLs where SFEP has expertise and or the ability to best support implementation efforts. Focus will be to develop projects and funding for work to reduce mercury loadings in the Guadalupe watershed; reduce pesticide impacts to the region's urban streams, addressing low dissolved oxygen (DO) and methyl mercury in Suisun Marsh and continuing work on reducing PCBs in building materials during construction demolition. *Question about selenium (2007 Action PO-1.5): Reinforce existing programs and develop new incentives where necessary to reduce selenium levels in agricultural drainage.* Task 1: For mercury in the Guadalupe watershed, manage and complete the remediation projects currently being done by the county with the assistance of SFEP [Calcine removal]. Milestone: TBD Task 2: Develop a behavior change campaign aimed at achieving reduced use of household pesticides that impact beneficial uses of the bay. Possibly modify state's pesticide regulation program to help ensure reduced consumer usage. Milestones: TBD Task 3: Support on-going work in Suisun marsh to evaluation existing water management BMPs and adjust management efforts to address DO and methyl mercury. Milestone: TBD
BACKGROUND	Total Maximum Daily Loads (TMDLs) are action plans to restore clean water. Section 303(d) of the federal Clean Water Act requires that states identify water bodies -- bays, rivers, streams, creeks, and coastal areas -- that do not meet water quality standards, and the pollutants that impair them. TMDLs examine the water quality problems, identify sources of pollutants, and specify actions that create solutions. They are adopted by the SF Bay Regional Water Board (Regional Water Board) as amendments to our Region's Basin Plan. Currently the Regional Water Board has 22 TMDLs completed or under development focused primarily on sediments, pathogens and nutrients. Two TMDLs are bay-wide (mercury and PCBs) and an additional TMDL covers all the urban streams in the region for pesticide toxicity. Given the focus of the SFEP, it is most appropriate that the Partnership focuses on the regional TMDLs of PCBs, mercury and pesticides. All urban creeks in the San Francisco Bay Area are on California's 303(d) list of impaired water bodies due to observations of aquatic toxicity, primarily due to runoff of commonly used insecticides. According to the 2003 Mercury TMDL Report, approximately 1,220 kg of mercury enters San Francisco Bay annually from sources including bed erosion (about 460 kilograms per year (kg/yr)), the Central Valley watershed (about 440 kg/yr), urban stormwater runoff (about 160 kg/yr), the Guadalupe Riverwatershed (about 92 kg/yr), direct atmospheric deposition (about 27 kg/yr), non-urban stormwater runoff (about 25 kg/yr), and wastewater discharges (about 19 kg/yr). Research done during development of the TMDL found that pesticides applied around homes according to label instructions can and do lead to toxicity in local water bodies. Education and outreach initiatives funded by State grants, wastewater and stormwater dischargers, and others promote the behavior change necessary to reduce this threat of pesticide-related toxicity in our creeks.

ACTION 33 **Manage nutrients in the Estuary**	***Action under development*** ACTION DESCRIPTION: Manage nutrients in the Estuary by supporting and advancing the San Francisco Bay Water Resources Control Board's Nutrient Management Strategy for San Francisco Bay. Task 1: Ensure continuation of the current USGS long-term monitoring of nutrients through a federal-state-local partnership. Milestone: Establish partnership with dedicated secure funding by October 2017 Task 2: Seek grant funding for nutrient load reduction studies. Milestone: Ongoing Task 3: Update the Nutrient Management Strategy for San Francisco Bay based on monitoring and modeling and load reduction study results. Milestone: Updated Nutrient Management Strategy by June 2018
BACKGROUND	According to the most recent Pulse of the Bay (RMP 2014), evidence suggests that San Francisco Bay's resistance to the harmful effect of nutrient enrichment is weakening. Since the late 1990s, regions of the bay have experienced significant increases in phytoplankton; however, recent data suggest levels may be leveling off in the South Bay. These increases could be related to higher light levels caused by declining sediment loads and a decrease in bay bottom-grazers. Treated wastewater is the biggest source of nitrogen and phosphorus south of the bay bridge. This information underscores the need for robust long-term monitoring of nutrient conditions and continuing research investigations on this issue. However, federal funding to continue the long-term monitoring conducted by USGS has decreased and further cuts are possible. The existing 5-year Nutrient Management Strategy for San Francisco Bay (November 2012) calls for documenting current understanding of nutrient dynamic and the key unanswered questions; conducing a monitoring program that supports regular assessment of the issue; setting guidelines (water quality objectives and assessment framework) for adverse effects of nutrients; quantity nutrient loads and create models to support decisions about nutrient management. Nutrients are also a priority for the Delta Science Plan and significant nutrient loads from the Delta are known to reach Suisun and the North Bay. Recent studies question whether nutrients are drivers for Submerged Vegetation (e.g Hyacinth, Egeria and others) or for cyanobacteria.

ACTION 34 **Reduce trash input into the Estuary**	ACTION DESCRIPTION: Assist regional municipalities in work to reduce trash input into the estuary to attain trash reduction objectives by helping to create a regional trash monitoring program and trash tracking method, and by supporting ordinances and outreach programs that change behavior to reduce trash at its source. Task 1: Review the status of the Trash Tracker program developed by SFEP and SFEI; determine how to adjust, expand, and enhance that program to better meet the tracking needs of the 2015 Municipal Regional Stormwater Permit (MRP) requirements. Milestone: Publish a review with recommendations on enhancements by December 2016 Task 2: With partners, assess the options for developing a regional trash monitoring program; elements, cost, owners. Milestone: Assessment complete by June 2017 Task 2: Work with state and federal funding agencies to support trash reduction social marketing campaigns with a focus on hot spot geographic areas throughout the region. Milestone: Begin June 2016 and ongoing
BACKGROUND	Trash is a serious problem in the urbanized estuary. As reported by Bay Area Storm Management Agencies Association (BASMAA) in a 2012 trash report: Every year, 1.36 million gallons of trash flows into San Francisco Bay and its creeks from storm drains. Plastic makes up approximately 49% of the trash; paper products (bags, newspapers, receipts) make up 21%, single-use plastic bags make up approximately 8%, polystyrene foam makes up 7%. Beverage containers and miscellaneous (including cigarette butts) make up the remaining 15%. In 2009, state regulators required cities and counties to reduce the amount of trash going into the Estuary by 40 percent by 2014 or face fines, with a goal of reducing it 100 percent by 2022. By adopting ordinances, restricting plastic bags and Styrofoam food ware and limiting outdoor smoking, cities and counties can help prevent plastics, toxic chemicals and other pollutants from impacting our waterways and the Bay.

ACTION 35 **Develop and expand public involvement, education and advocacy efforts that support the CCMP**	ACTION DESCRIPTION: Through conferences, workshops, print media, and SFEP and partners' websites, provide local decision makers and the general public with a reliable source of information needed to make policy and personal decisions in favor of Estuary health. Improve understanding by the public, national, local and regional leaders about the health of the Estuary and needed actions to improve its condition. Task 1: Promote public involvement in Estuary protection and restoration through expanded use of interactive web-based information delivery through SFEP and Friends of the Estuary. Milestone: Ongoing; website reviewed for quality and possible upgrade by December 1 of each year. Task 2: Educate the regional community through hosting of the biennial State of the Estuary conference, support of the biennial Bay-Delta Science Conference and support of the Estuary News magazine. Milestones: SOE 2017, 2019, 2021; Delta Science 2016, 2018, 2020 Task 3: Create and implement an on-line CCMP reporting process that lets stakeholders, action owners, elected officials and the public see the progress being made on each of the final CCMP actions approved as part of this plan. Milestones: Annual reporting on CCMP progress 2016-2021. Task 4: On a 5-year cycle, provide up-to-date information about the health status of the Estuary through an updated State of the Estuary Report and update the CCMP. Milestones: Updated SOTER 2020, updated CCMP 2021.
BACKGROUND	The future health of the Estuary depends on support from local leaders for the CCMP and for federal and state funding, and increased support for local environmental education and outreach in select Bay watersheds. The San Francisco Estuary Partnership is actively engaged in developing and expanding public engagement in the work that supports the CCMP will result in increased level of awareness about Bay health and restoration among Bay Area residents and success in increasing national, state, and local support for CCMP objectives, through ongoing funding support and legislation. Key education and engagement efforts include SFEP's website, the State of the Estuary Conference and the Bay-Delta Science Conference, the Estuary News, the State of the Estuary Report, and the CCMP itself. Annual reporting on the CCMP includes reporting on progress met towards completing actions as well as resulting effects on the health of the Estuary.

ACTION 36 **Foster support for resource protection and restoration by providing Estuary-oriented public access and recreational opportunities compatible with wildlife**	ACTION DESCRIPTION: Provide Estuary-oriented public access and recreational opportunities that avoids or minimizes adverse impacts to sensitive habitats and wildlife while accommodating education, biking, hiking, wildlife viewing, and other Estuary-oriented recreational activities to increase recognition by regional citizens and decision-makers about the value of natural resources and foster support for Estuary resource protection and restoration. Task 1: Add to the San Francisco Bay Trail, closing critical gaps in the main alignment (the "spine") that links the shoreline of all nine Bay Area counties, while avoiding adverse effects on sensitive resources and wildlife. Milestone: Addition of 100 miles of new trail segments to the Bay Trail spine by 2021 Task 2: Identify opportunities to create or enhance high quality public access, recreational and educational opportunities that provide diverse and desirable experiences that are designed to avoid adverse impacts to sensitive resources and wildlife. Milestone: Completion of five new or enhanced public access or recreational opportunities by 2021 Task 3: Promote distribution of maps to boaters that identify areas where shorebirds and waterfowl and harbor seals forage, rest and roost to various partners to help eliminate or minimize intrusion Milestone: Identify two appropriate forums/mechanisms and distribute maps to boaters per year 2016-2021
BACKGROUND	The Estuary and its shoreline provide important refuge, foraging, and nesting habitat for wildlife and also provide opportunities for unique recreational and educational experiences. Participating in recreational activities along the shoreline or in the water allows the public to discover, experience and appreciate the Bay's natural resources and inspires them to take an active interest in Estuary protection and restoration efforts. The Estuary provides several regional trail systems: the San Francisco Bay Trail, the San Francisco Bay Area Water Trail; the Bay Area Ridge Trail (with views of the Bay), Sacramento River trails, and the Great California Delta Trail. The San Francisco Bay Trail is currently 68% complete, with 341 of 500 planned miles of trail around the Bay. The Ridge Trail is 65% complete, with 360 of 550 planned miles open to the public. The San Francisco Bay Water trail is a more recent endeavor, but has designated 11 of 111 planned sites that meet criteria for public access to the water. Progress on the Delta trail is harder to quantify, though miles of trail are planned through all 5 Delta counties. In addition to (or in lieu of) new trail miles, development and restoration projects around the Estuary may also provide other diverse and desirable recreational experiences as part of their projects. It is important to recognize that public access to the shoreline may have adverse effects on wildlife and may result in long-term population and species effects. The type and severity of effects, if any, on wildlife depend on many factors, including site planning, the type and number of species present, and the intensity and nature of human activity. Recreational activities can be located, designed, and managed to prevent significant adverse impacts from human intrusion on sensitive habitats and on wildlife species. Signage and other educational methods, such as docent programs, can be employed to promote stewardship, inform the public of the importance and sensitivity of certain habitats and wildlife, and encourage safe, environmentally responsible recreation. Recommendations for avoiding adverse impacts to wildlife have been developed by BCDC and by the Joint Venture. As sea level rises, the transition zone between tidal areas and uplands will become even more critical for wildlife species requiring high tide refuge. Public access along the shoreline should include consideration sea level rise and be designed to avoid or minimize potential future impacts on wildlife.

ACTION 37 **Increase regional coordination among all levels of government to support implementation of the CCMP**	***Action under development – Tasks are placeholders*** ACTION DESCRIPTION: Identify, educate, and create working relationships with and among the universe of elected bodies and committees with most direct potential influence on CCMP related issues to advance regional coordination between elected officials at all levels of government working together to support decisions and provide funding to address issues related to the CCMP. Task 1: Create and update, as needed, a matrix that identifies standing bodies of elected officials relevant to CCMP goals and objectives. *This would likely include: ABAG Executive Committee, Joint Powers Committee, Metropolitan Transportation Commission, BAAQMD, CARB, State Legislative Committees/Caucuses, etc.* Matrix (posted on SFEP website) should describe each body's mission, meeting schedule, staff contact info, and influence over funding programs. Milestone: June 2016 Task 2: Routinely communicate (in writing or in person) with standing bodies of elected officials to provide updates, status reports, and/or timely recommendations on issues and concerns related to CCMP. Communications should encourage sharing information and resources among standing groups to increase potential coordination. Milestone: September 2016 – on-going Task 3: Circulate relevant white papers on CCMP related issues to appropriate elected officials and standing bodies. Attendant cover letters, executive summaries, or conclusions should include recommendations for bodies of elected officials to collaborate and focus funding programs, where appropriate Milestones: September 2016 – on-going
BACKGROUND	***Under development***

ACTION 38 **Increase funding mechanisms to implement CCMP**	ACTION DESCRIPTION: Increase funding to undertake short and long term actions increase and sustain the health of the San Francisco Estuary Task 1: Create and disseminate informational materials regarding the proposal to amend Prop 218 to give stormwater "exempt" status as a "utility" on par with drinking and waste water. Milestone: Amendment to Prop 218 passed by voters in November 2016 Task 2 (if needed): If Prop 218 amendment passes, support local public processes to: 1) establish the "utility", 2) determine scope and level of services, and 3) determine rates and rate structures. Allowable stormwater utility expenditures could include: watershed and GI planning; environmental restoration, capital improvements, operations & maintenance, and outreach and education. Milestone: Establish stormwater utilities, rates, and program scopes by 2018 Task 3 (if needed): Create and disseminate informational materials regarding Restoration Authority ballot measure for June or November 2016. Milestone: Restoration Authority funding approved by voters by November 2016 Task 4: Explore and pilot public-private partnerships to offset recurring O&M costs through formalized volunteer stewardship programs that include site-specific routine trash and weed abatement, supplemental planting, and irrigation as appropriate. Milestone: Initiate Pilot Volunteer Program in two local jurisdictions by January 2018. Task 5: (See GI/LID action, Task 3): Work with appropriate agencies and decision-makers to include GI/LID as allowable expenses within transportation infrastructure and climate change adaptation investment programs Milestone: Plan Bay Area and MTC grants allow for GI/LID by 2018
BACKGROUND	Existing local and regional public agencies do not have adequate dedicated funding streams to undertake a variety of desired actions (restoration, conservation, watershed planning, green infrastructure) that would result in environmental benefits. There are a number of near term opportunities at the state and regional level to create and/or increase existing funding mechanisms. An effort is currently underway to exempt "stormwater" from Prop 218 requirements, which would allow local governments more easily to establish or raise fees for a variety of stormwater related activities including: watershed planning, green infrastructure practices, O&M, etc. The Stormwater Initiative (Assembly Bill 1362- Omnibus Act Amendment) seeks to pass a Constitutional Amendment through the State Legislature with a November 2016 ballot measure allowing voters to designate stormwater as a utility on par with drinking water, wastewater, and refuse services (all exempt from Proposition 218 requirements). If approved, local stormwater agencies could establish or raise rates in a manner similar to water and wastewater districts. The ballot measure, by itself, will not raise revenues—a local public process would be required to: 1) establish the "utility", 2) determine scope and level of services, and 3) determine rates and rate structures. Allowable stormwater utility expenditures could include: watershed and GI planning; environmental restoration, capital improvements, operations and maintenance, and outreach and education. The San Francisco Bay Restoration Authority (Authority) is a new regional government agency charged with raising and allocating resources for the restoration, enhancement, protection, and enjoyment of wetlands and wildlife habitat in the San Francisco Bay and along its shoreline. The Authority was created by the California legislature in 2008 with the enactment of AB 2954 (Lieber). However, the Authority requires a mechanism to acquire funds for dispersal. The Authority is considering placing a measure on the ballot throughout the nine Bay Area counties to fund this work. A third funding opportunity is specific to Green Infrastructure/Low Impact Development projects and would consist of including green infrastructure measures as eligible expenditures for Metropolitan Transportation Commission and One Plan Bay Area grants.

IV. TRACKING PROGRESS

Chapter under development

Introduction

Tracking progress of the CCMP is a critical component of the plan. Two measures of progress will be tracked: progress towards completion of each action (outputs); and progress towards increasing the health of the Estuary (outcomes). Each action in the CCMP has an identified owner or owners responsible for leading one or more and tasks, and each task within an action includes measurable milestones. In addition, actions include metrics for environmental outcomes as feasible. Metrics are linked to the State of the Estuary Report indicators where possible.

APPENDIX A
MATRIX OF GOALS, OBJECTIVES AND ACTIONS

		GOAL 1: Sustain and Improve Habitats and Living Resources of the Estuary			GOAL 2: Increase the Resiliency of the Estuary to Sustain Functions in the Face of Changing Climate Conditions			GOAL 3: Improve Water Quality and Increase Water Quantity to the Estuary			GOAL 4: Champion the Estuary		
		Objective a. Protect, restore, and enhance environmental conditions and processes that support self-sustaining natural communties	Objective b. Eliminate or reduce threats to natural communities	Objective c. Conduct scientific research and monitoring to measure status, develop and refine management actions, and track progress	Objective d. Increase resilience of tidal habitats and tributaries to climate change	Objective e. Increase resilience of communites at risk from climate change impacts while promoting and protecting natural resources	Objective f. Promote integrated, coordinated, multi-benefit approaches to increasing resiliency	Objective g. Increase drought-resistance and water efficiency and reduce demand on imported water	Objective h. Improve freshwater flow patterns, quantity, and timing to better support natural resources	Objective i. Reduce contaminants entering the system and improve water quality	Objective j. Build public support for the value of natural resources and the need to protect, restore and maintain a healthy Estuary	Objective k. Build on regional leadership and support to protect, restore and maintain a healthy Estuary	Objective l. Promote efficient and coordinated regional governance
	ACTIONS												
1	Develop and implement watershed approaches to comprehensive aquatic resource protection	X	X	X	X	X	X						X
2	Protect, restore and enhance tidal marsh and tidal flat habitat	X	X		X	X							
3	Identify, protect, and create transition zones	X	X		X								
4	Protect, restore and enhance intertidal and subtidal habitats	X	X	X									
5	Maximize habitat benefits of managed wetlands/ponds	X	X		X	X							
6	Protect, restore, and enhance riparian habitat	X	X		X	X							
7	Protect and restore critical coldwater habitat in tributary streams	X	X										
8	Establish a regional wetland and stream monitoring and assessment program	X	X	X			X						
9	Protect, restore, and enhance seasonal wetlands	X	X										
10	Minimize the impact of invasive species		X										
11	Increase the efficacy of predator management		X	X									

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	ACTIONS												
12	Increase carbon sequestration through wetland restoration, creation, and management	X		X	X		X						
13	Restore Estuary-watershed connections for multiple benefits, including flood risk management and habitat	X	X	X	X	X	X						
14	Manage sediment on a regional scale and advance beneficial reuse	X		X	X	X	X						
15	Demonstrate how restored habitats serve as "natural infrastructure" that provide multiple benefits	X	X	X		X	X						
16	Advance natural resource protection while increasing resiliency of shoreline communities		X			X							
17	Integrate natural resource protection into local government hazard mitigation, response, and recovery planning		X			X							
18	Improve regulatory processes regarding permitting and monitoring innovative multi-benefit projects						X						X
19	Develop long-term drought plans							X					

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	ACTIONS												
20	Reduce Bay Area landscape water use							X					
21	Increase water recycling						X	X	X				
22	Change public's perception of the value of water to achieve long-term reduction in water use							X					
23	Promote potable reuse with regional agencies and following state lead, standards for direct potable reuse							X					
24	Assess potential application of the constitutional standard of waste and unreasonable use								X				
25	Integrate water issues into the updated Plan Bay Area and Delta Sustainable Communities Strategies							X	X	X			
26	Adopt new Bay-Delta freshwater inflow/outflow standards that better protect all beneficial uses								X				
27	Increase agricultural water use efficiency							X	X				
28	Identify and work to eliminate illegal water diversions in the San Francisco Bay region							X	X				
29	Address emerging contaminents									X			

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	ACTIONS												
30	Decrease raw sewage discharges									X			
31	Manage stormwater with Low Impact Development/Green Infrastructure practices					X	X			X			
32	Implement select Total Maximum Daily Loads (TMDLs)									X			
33	Manage nutrients in the Estuary									X			
34	Reduce trash input into the Estuary									X			
35	Develop and expand public involvement, education, and advocacy efforts that support the CCMP										X		
36	Foster support for resource protection and restoration by providing Estuary-oriented public access and recreational opportunities compatible with wildlife		X								X		
37	Increase regional coordination all levels of government to support implementation of the CCMP											X	X
38	Increase funding mechanisms to implement the CCMP											X	X

APPENDIX B
GLOSSARY OF TERMS AND ACRONYMS

ABAG: Association of Bay Area Governments

Acre-foot: An acre of water one foot deep (approximately 326,000 gallons).

Adaptive Management: A process originally developed to manage natural resources in large scale ecosystems by deliberate experimentation and systematic monitoring of the results. More broadly, it is the incorporation of a formal learning process into conservation action. Specifically, it is the integration of design, management, and monitoring to systematically test assumptions in order to learn and adapt

Anadromous: Fish that live some or all of their adult lives in salt water but migrate to fresh water to spawn.

BAFPAA: Bay Area Flood Protection Agencies Association

BARC: Bay Area Regional Collaborative

BASMAA: Bay Area Stormwater Management Agencies Association

BCDC: San Francisco Bay Conservation and Development Commission

BEHGU: Baylands Ecosystem Habitat Goals Update. A science-based update to the 1999 report, the *Baylands Ecosystem Habitat Goals*. The update is to be released in 2015.

Beneficial Use: Uses of the waters of the state that may be protected against quality degradation including: domestic, municipal, agricultural, and industrial supply; recreation and navigation; and the preservation of fish and wildlife.

Beneficial Reuse (of Sediment): Placement of dredged or excavated sediment in beneficial reuse environments. Beneficial reuse may include wetland creation and restoration or levee maintenance. Reuse of dredged material minimizes disposal in the San Francisco Bay and deep ocean disposal sites.

Benthos: The area at the bottom of a body of water inhabited by plants and animals.

Best Management Practice: A method, activity, maintenance procedure, or other management practice for reducing the amount of pollution entering a water body.

Bioaccumulation: Accumulation by organisms of contaminants by ingestion or from contact with the skin or respiratory tissue.

Biota: All living organisms that exist in a region.

Brackish: Slightly salty water that is a mixture of freshwater and ocean water.

Cal EPA: California Environmental Protection Agency

Carbon Sequestration: The process by which atmospheric carbon dioxide is taken up by trees, grasses, and other plants through photosynthesis and stored as carbon in biomass (trunks, branches, foliage, and roots) and soils. The sink of carbon sequestration in vegetation and soils helps to offset sources of carbon dioxide to the atmosphere.

CDFW: California Department of Fish and Wildlife

Conservation Easement: A restriction placed on a piece of property to protect its associated resources. The easement is either voluntarily donated or sold by the landowner and constitutes a legally binding agreement that limits certain types of uses or prevents development from taking place on the land in perpetuity while the land remains in private hands.

Contamination: Impairment of water quality by waste to a degree that creates a hazard to public health through the poisoning or through the spread of disease.

Cumulative Effects: The combined environmental impacts that accrue over time and space from a series of similar or related individual actions, contaminants, or projects. Although each action may seem to have a negligible impact, the combined effect can be severe.

Delta Outflow (Index): An estimate of the flow of freshwater from the Sacramento-San Joaquin River Delta into San Francisco Bay; units of measurement are cubic meters per second

Diversion: The act of turning the natural course of water for use in other purposes.

Dredging: The removal of sediments from the Estuary, generally for navigation purposes.

DSC: Delta Stewardship Council

DWR: California Department of Water Resources

Effluent: Wastewater discharged into the Estuary from point sources.

Food Web: Network of interconnected food chains and feeding interactions among organisms.

Green Infrastructure: Systems and practices that use or mimic natural processes to infiltrate, evapotranspirate (the return of water to the atmosphere either through evaporation or by plants), or reuse stormwater or runoff on the site where it is generated.

Groundwater: The water beneath the surface of the ground, consisting largely of surface water that has seeped down.

Groundwater recharge: A hydrologic process where water moves downward from surface water to groundwater. Recharge occurs both naturally and through anthropogenic processes, where rainwater and or reclaimed water is routed to the subsurface.

IRWMP: Integrated Regional Water Management Plan

Indigenous: Living or occurring naturally in a particular region or environment.

Intertidal: Of or relating to the region that is above the low-water mark and below the high-water mark.

Invertebrates: An animal lacking a backbone, such as an arthropod, mollusk, etc.

Levee: An embankment constructed to prevent the overflow of a body of water.

Low Impact Development (LID): An approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as

preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product.

Natural Infrastructure: A range of strategies that leverage natural processes to provide multiple benefits —such as flood protection, aquatic habitat, water quality, and carbon sequestration. Natural infrastructure project approaches range from the preservation of natural systems to combinations of ecological restoration and engineered structures.

NOAA: National Oceanic and Atmospheric Administration

Non-indigenous: Species not naturally living or growing in a particular area.

Nonpoint Source Pollution: Pollution that enters water from dispersed and uncontrolled sources, such as surface runoff, rather than through pipes.

Nutrients: Chemical elements or compounds necessary for or contributing to an organism's metabolism, growth or function. Nutrients provide energy and are used as molecular building blocks in the biosynthesis of cellular structures. Nitrogen (N) and phosphorous (P) are critical nutrients for phytoplankton thus their growth can be limited by the availability of these nutrients when light and temperature are adequate.

PAHs: Polycylic or Polynuclear Aromatic Hydrocarbons. A class of complex organic compounds, some of which are persistent and can cause cancer.

PCBs: Polychlorinated Biphenyls. A group of manufactured chemicals. If released to the environment, PCBs persist for long periods and can biomagnify in food chains. PCBs are suspected of causing cancer in humans and other animals.

Permeable: Able to be infiltrated by water

Plan Bay Area: A long-range integrated transportation and land-use/housing strategy through 2040 for the San Francisco Bay Area. The 2013 Plan was jointly approved by the Association of Bay Area Governments (ABAG) Executive Board and by the Metropolitan Transportation Commission (MTC). The Plan includes the region's Sustainable Communities Strategy and the 2040 Regional Transportation Plan.

Pollutant: A harmful chemical or waste material discharged into the environment.

Resiliency: The capacity of individuals, communities and systems to survive, adapt, and grow in the face of stress and shocks, and even transform when conditions require it. In the CCMP, the term generally refers to resiliency to impacts from climate change.

Riparian Area: Most broadly the aquatic ecosystem and the portions of the adjacent terrestrial ecosystem that directly affect or are affected by the aquatic environment. Generally refers to rivers and streams and the adjacent habitat.

RMP: Regional Monitoring Program for water quality in the San Francisco Bay.

Runoff: Water from rain, melted snow, or agricultural or landscape irrigation that flows over the land surface.

Salmonid: Any of various fishes of the family Salmonidae, which includes the salmon and trout.

Seasonal Wetland: Terrestrial depressions that are inundated by winter and spring rainfall and flooding.

SFEP: San Francisco Estuary Partnership

SCC: California State Coastal Conservancy

SFBJV: San Francisco Bay Joint Venture

SFBNERR: San Francisco Bay National Estuarine research Reserve

SFBRWQCB (or SF Bay Regional Water Board): San Francisco Bay Regional Water Quality Control Board

SOTER: State of the Estuary Report

Special Status Species: Any species which is listed, or proposed to be listed, as threatened or endangered.

Subsidence: The sinking of the surface relative to sea level.

Subtidal: Region below low tide.

Sustainable Communities Strategy: Required by SB 375 (2008; Steinberg), a long-term plan to support the State's climate action goals to reduce greenhouse gas (GHG) emissions through coordinated transportation and land use planning with the goal of more sustainable communities.

SWRCB (or State Water Board): California State Water Resources Control Board

TMDL: Total Maximum Daily Load

Transition Zone: The zone between tidal wetlands and adjacent uplands.

USACE: United States Army Corps of Engineers

USEPA: United States Environmental Protection Agency

USGS: Unites States Geological Service

USFWS: United States Fish and Wildlife Service

Vernal Pools: Depressions that fill with rain water in the wet season and dry out in the spring. Vernal pools often contain plants that can withstand extremes in water availability.

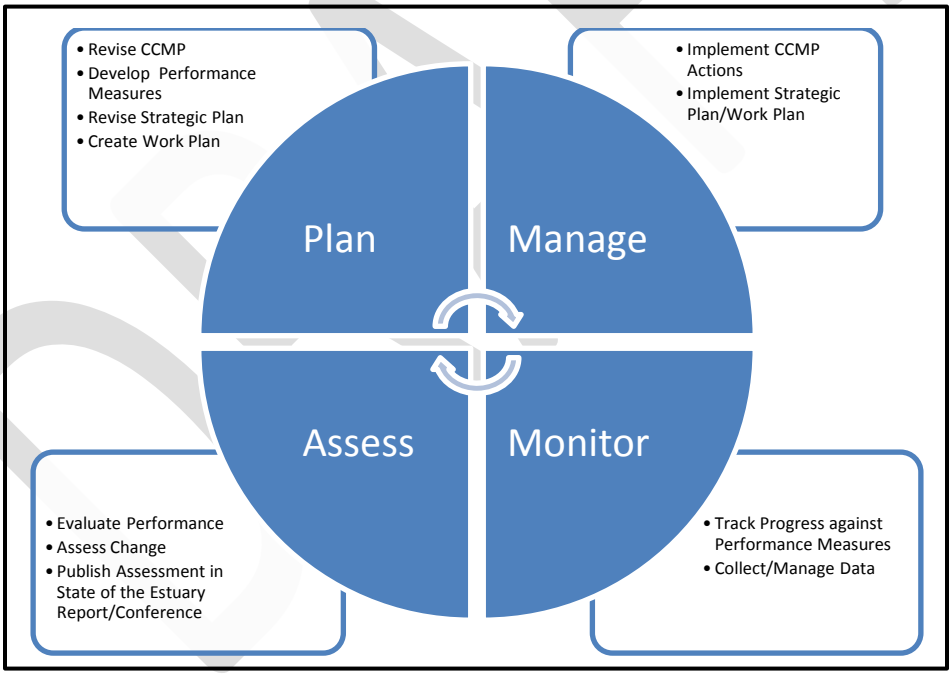
APPENDIX C
2016 CCMP REVISION PROCESS

The revision of the CCMP took place over two and a half years, from late 2013 to final approval and release in April, 2016.

Key Objectives

The 2016 revision was guided by a suite of key objectives:

- Implement a focused and strategic revision process that results in less than 50 priority actions
- Increase coordination and integration within SFEP's entire planning area, both Bay and Delta
- Acknowledge key regional plans and policy documents developed since initial CCMP was created
- Include measurements to track progress for all actions and develop tracking tool
- Integrate the State of the Estuary Report, State of the Estuary Conference, SFEP's Strategic Plan and the CCMP in an adaptive management framework for SFEP



Adaptive Management Cycle for SFEP

Roles and Responsibilities

SFEP Executive Council: Comprised of: California Natural Resources Agency Secretary; California Environmental Protection Agency Secretary; US Environmental Protection Agency Region 9 Administrator; US Fish and Wildlife Service Regional Pacific Southwest Regional Director; and Association of Bay Area Governments Executive Director. The Executive Council was responsible for final review and approval of the CCMP.

SFEP Implementation Committee (IC): The 27-member IC is comprised of partners who are engaged in implementing the CCMP. The IC meets quarterly and provided overall guidance, interim input, and final review and approval of revised CCMP.

IC CCMP Steering Committee: Comprised of volunteers from IC. The 12-person Steering Committee met periodically to guide and direct the overall update as representatives of the IC, and participated as content experts on the Program Area Subcommittees.

CCMP Program Area Subcommittees: Three initial Program Area Subcomittees were formed on topic areas corresponding to the attributes of a healthy ecosystem as described in the 2011 State of the Bay Report: Living Resources, Habitats, and Water. The Subcommittees were comprised of Steering Committee members, SFEP staff, and 20 additional outside experts. The Subcommittees were responsible for developing key content for the revised CCMP. The Subcommittees initially met separately to develop content and later joined to review the entire suite of goals, objectives and actions.

SFEP Staff Team: Managed the overall CCMP revision process, including: developing agendas for and faciliating Steering Committee meetings; providing guidance for and participating directly on Program Area Subcommittees; and compiling and editing all content.

SFEP Partners/General Public: Interested parties not on the Steering Committee or Program Area Subcommittees provided input on interim products throughout the development process. SFEP staff engaged partners and the general public through various forums including presentations, meetings, the SFEP website, and the State of the Estuary Conferences in 2013 and 2015. A draft of the CCMP was widely released in September, 2015 and public comment was actively solicited on the draft.